

SAN FRANCISCO WATERFRONT FLOOD STUDY

SFMTA Board Presentation

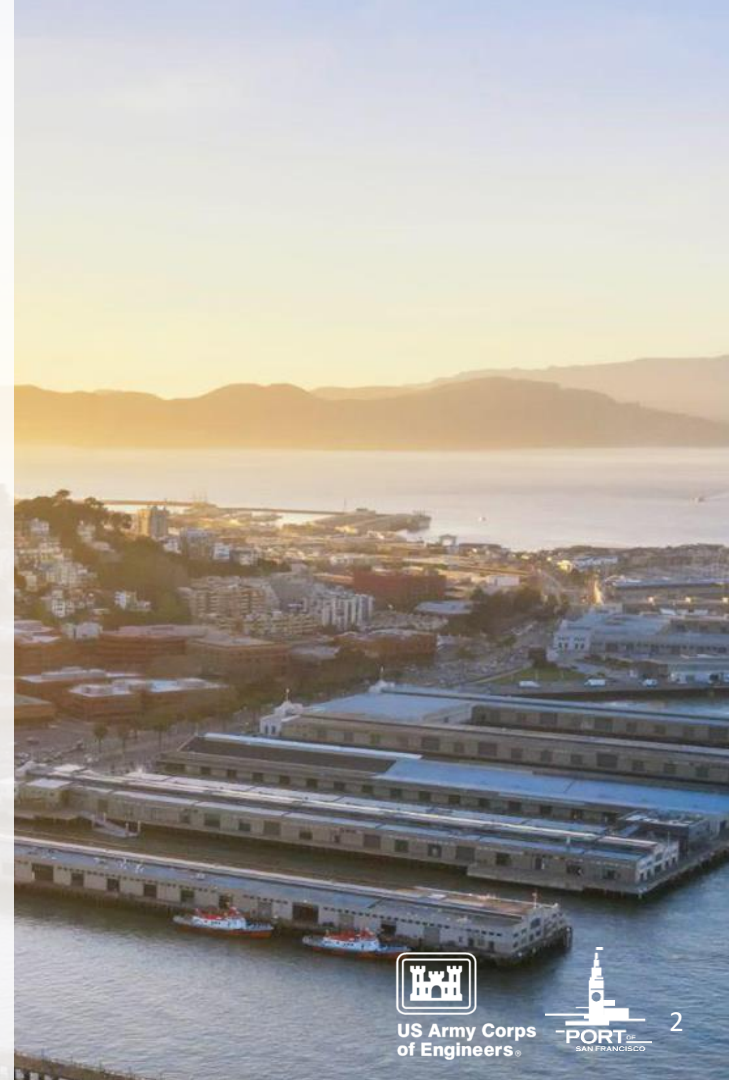
February 20, 2024



**US Army Corps
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AGENDA

- 1 Waterfront Flood Study**
- 2 Risks and Hazards**
- 3 The Draft Plan**
- 4 Key Policy Considerations**
- 5 Public Comment**



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WHAT IS THE FLOOD STUDY?

Analyzes **coastal flood risk** and effects of **sea level rise** along the **Port's jurisdiction of the Waterfront** over the next 100 years



Led by the **U.S. Army Corps of Engineers** in collaboration with the **City of San Francisco**



WHAT IS THE DRAFT PLAN?

Informs stages of **funding and design** towards targeted construction projects

Costs around **\$13.5 billion**

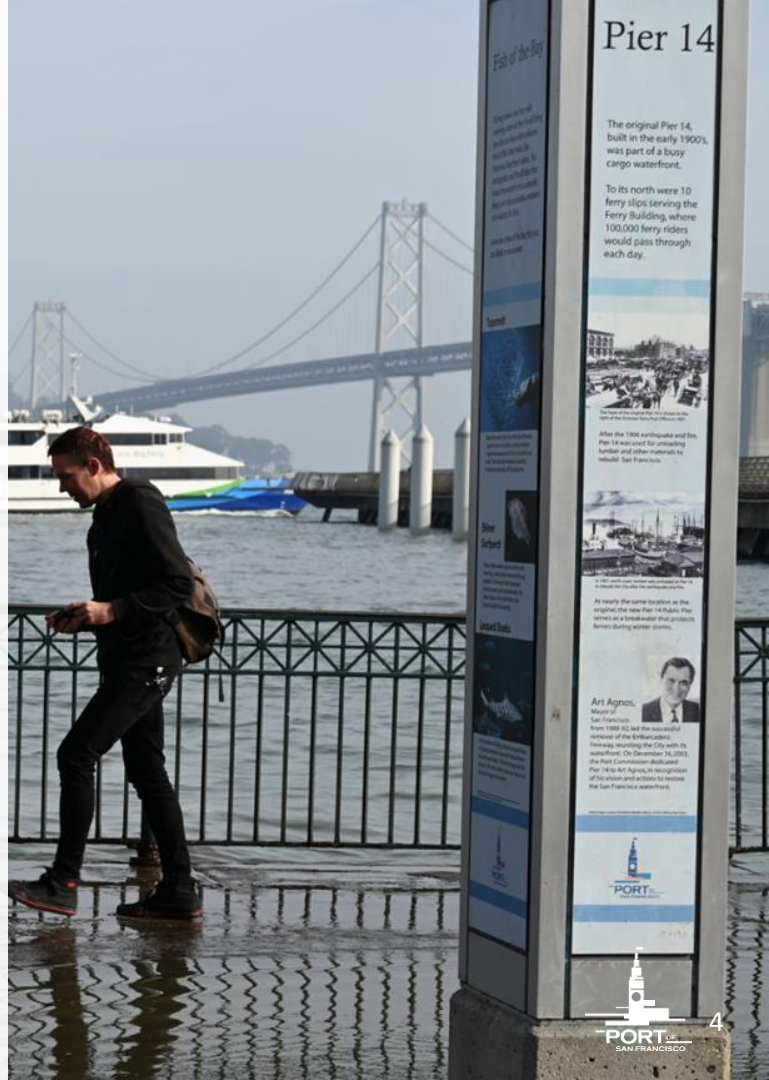
Federal government will pay **65% of the cost** if approved by the U.S. Congress

San Francisco
Planning

ONESF
Building Our Future



San Francisco
Water Power Sewer
A Division of the San Francisco Public Utilities Commission



Pier 14

The original Pier 14, built in the early 1900s, was part of a busy cargo waterfront.

To its north were 10 ferry slips serving the Ferry Building, where 100,000 ferry riders would pass through each day.



After the 1906 earthquake and fire, Pier 14 was used for unloading lumber and other materials to rebuild San Francisco.



At nearly the same location as the original, the new Pier 14 Public Pier serves as a destination for activities during winter storms.

Art Agnos, Mayor of San Francisco from 1988 to 1991, led the successful removal of the Embarcadero Freeway from the City with its waterfront. On December 16, 2005, the Port Commission dedicated Pier 14 to Art Agnos, in recognition of his vision and efforts to restore the San Francisco waterfront.



PORT
SAN FRANCISCO

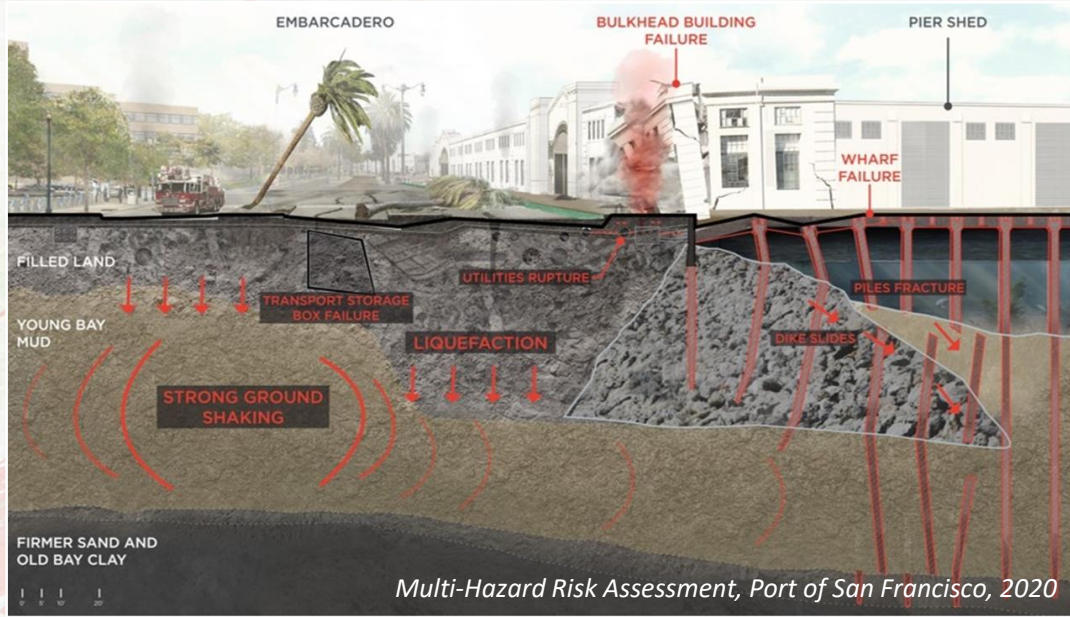
1 Waterfront Risks and Hazards



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WHAT'S AT RISK?

Seismic Hazard



San Francisco, 1906

Up to **40,000** people could be at risk on Port property if an earthquake occurs during the day



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WATERFRONT MOBILITY

Mobility and MTA operations are impacted by flooding today

Historic changes have been substantial along the waterfront



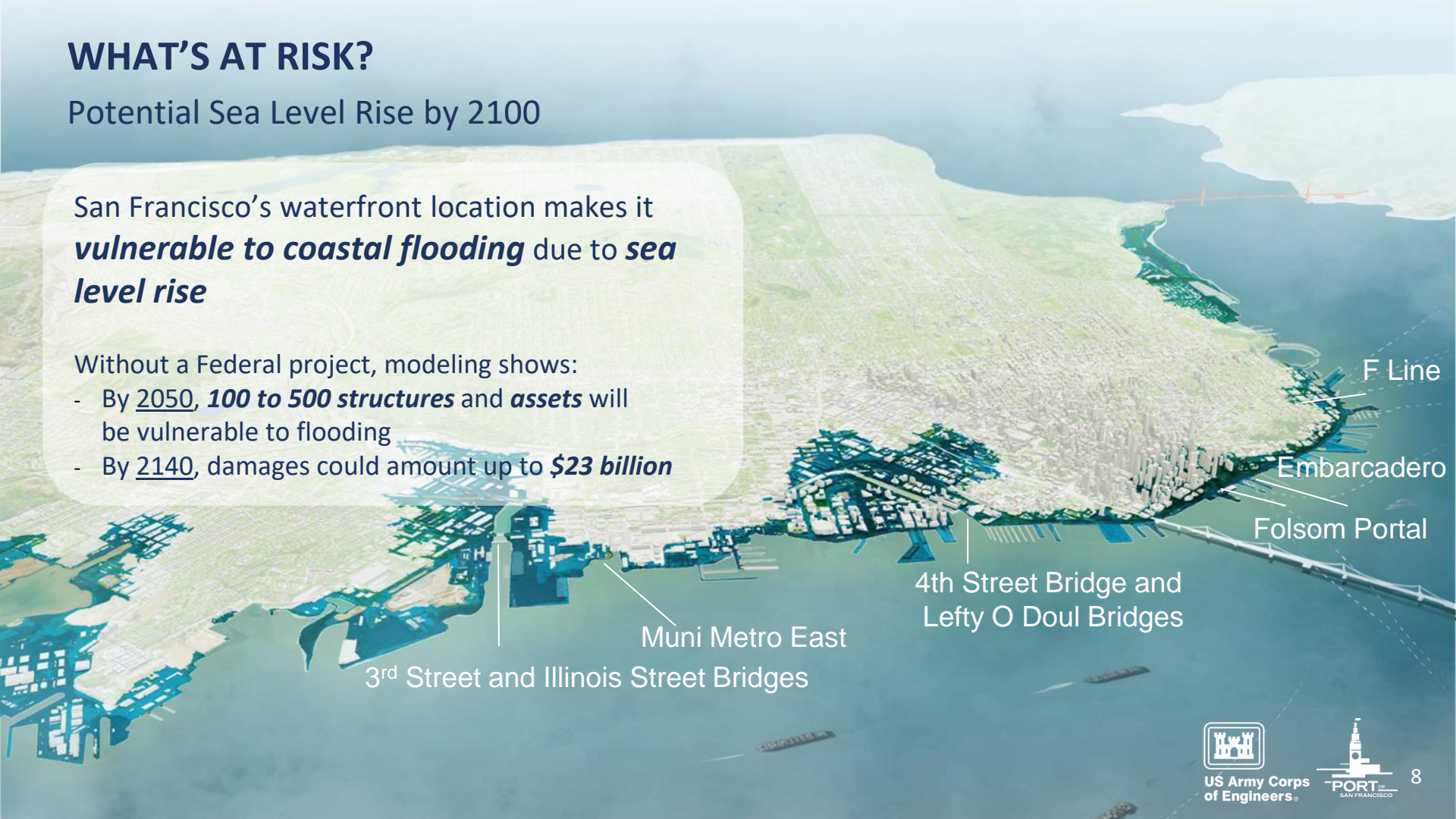
WHAT'S AT RISK?

Potential Sea Level Rise by 2100

San Francisco's waterfront location makes it **vulnerable to coastal flooding** due to **sea level rise**

Without a Federal project, modeling shows:

- By 2050, **100 to 500 structures** and **assets** will be vulnerable to flooding
- By 2140, damages could amount up to **\$23 billion**



F Line

Embarcadero

Folsom Portal

4th Street Bridge and
Lefty O Doul Bridges

Muni Metro East

3rd Street and Illinois Street Bridges



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HOW SAN FRANCISCO IS ADDRESSING THOSE RISKS

San Mateo County

Ocean Beach Adaptation

The ***San Francisco Waterfront Flood Study*** is one of several adaptation efforts by City and Federal agencies to address risks and build resilience

Northern Waterfront Adaptation

Southern Waterfront Adaptation / Yosemite Slough

San Francisco Waterfront Flood Study



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An aerial photograph of the San Francisco waterfront, showing the city skyline with prominent buildings like the Transamerica Pyramid and the San Francisco Ferry Building. The water is dark, and a long pier extends into it. A large blue semi-transparent box is overlaid on the left side of the image, containing the title text.

2 San Francisco Waterfront Flood Study



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WHERE ARE WE IN THE FLOOD STUDY PROCESS?

We are here
Release of Draft Plan



What to expect

Draft Plan for public engagement and technical reviews (*Winter 2024*), and Recommended Plan (*2025*)

What to expect

USACE Chief of Engineers recommends project to Congress to authorize funding.

What to expect

Detailed design and engineering, implementation, and phasing pending Congressional funding

What to expect

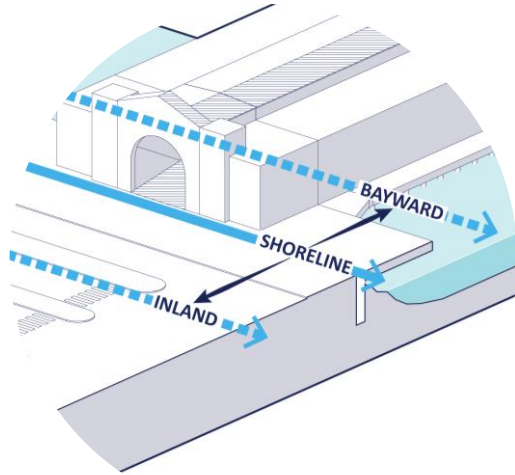
Phased construction of coastal flood protection infrastructure, related seismic stabilization, and other improvements



Note: Dates are approximate and subject to change. Projects will occur in phases. Many first actions will not be ready for implementation or construction in 2030 or 2050 respectively. The Draft Plan will be prioritized so not everything described will be done.

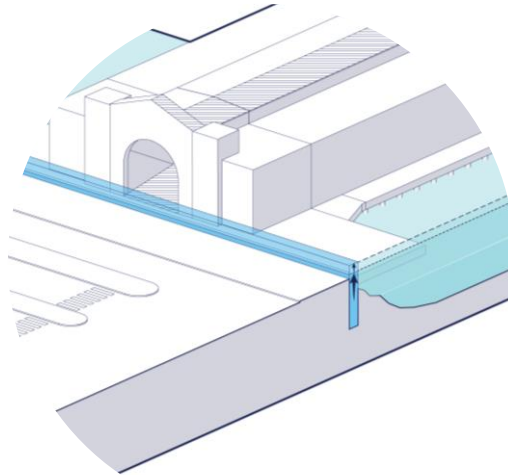
WHAT IS IN THE DRAFT PLAN?

Where to build flood defenses



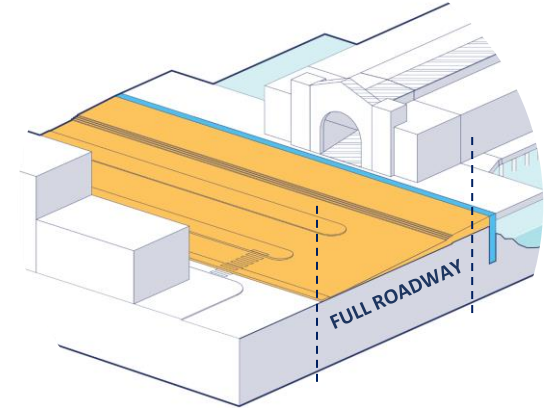
Have we located the flood defenses in the right place?

How high to build flood defenses



Should we invest in higher levels of protection first, or adapt in multiple phases?

How much space to use



More space provides more flexibility but is associated with more disruption. Less space means more abrupt grade changes.

*...and How flood defenses can **be adapted** in the future*

What's not being decided at this stage?

The Draft Plan **does not include** the following:

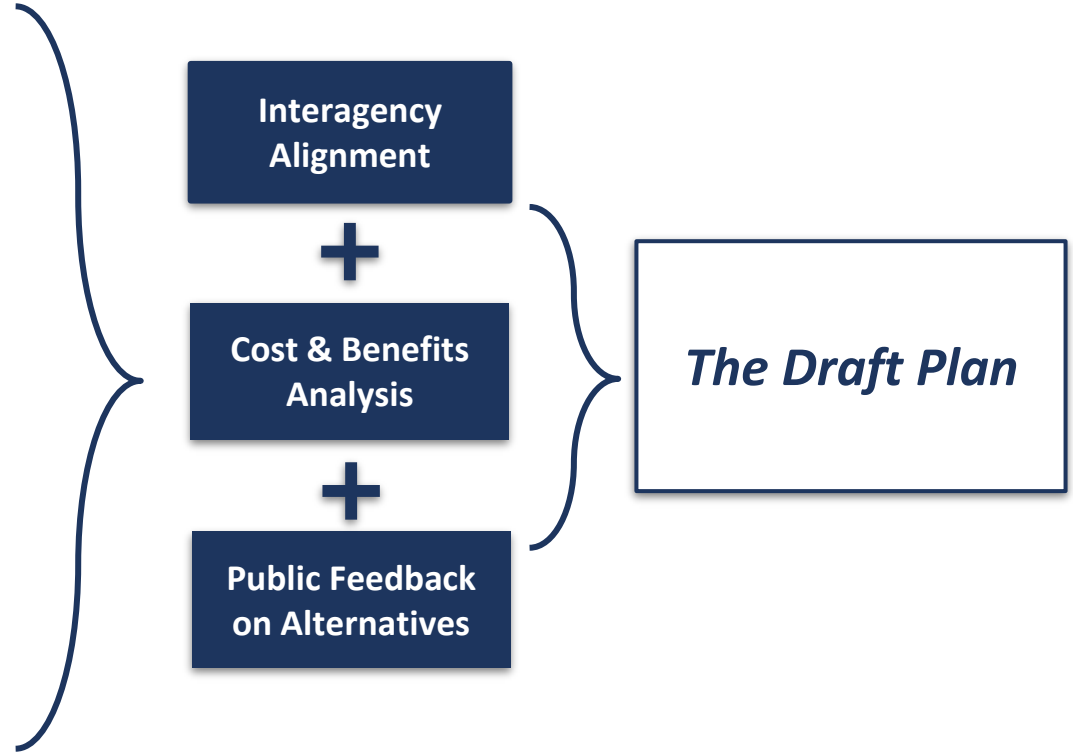
- Detailed designs for flood defenses
- Designs for waterfront streets, open spaces, and infrastructure (including pumping stations)
- Timing and sequencing of construction
- Funding plan

These elements will be developed during later project phases with the public, USACE and City Agencies.

The Draft Plan is not:

- A design for the future waterfront
- A plan for the Embarcadero Historic District, the Ferry Building and public plazas and roadway, and creek and shoreline amenities
- Project plans and implementation strategies will leverage other opportunities, align with other public and private projects, and reflect what the City can afford given other capital obligations

HOW DID WE DEVELOP THE DRAFT PLAN?



A COMPREHENSIVE COST BENEFIT ANALYSIS THAT ELEVATES EQUITY

This plan is a ***first*** for USACE.

Typical plan selection maximizes national economic benefits. This plan incorporates analysis and selects a plan considering:

- + Regional economic impacts (including jobs)
- + Environmental quality, consequences, and compliance (including pollution)
- + **Other social effects (including disproportionate effects on vulnerable populations)**



*Other Social Effects (USACE Analysis)
data included in Alternative Selection*

3 The Draft Plan



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KEY FEEDBACK THAT HELPED SHAPE THE DRAFT PLAN

Focus on life safety & emergency response

Put people first

Prioritize housing, disaster recovery facilities, utilities, transportation and businesses

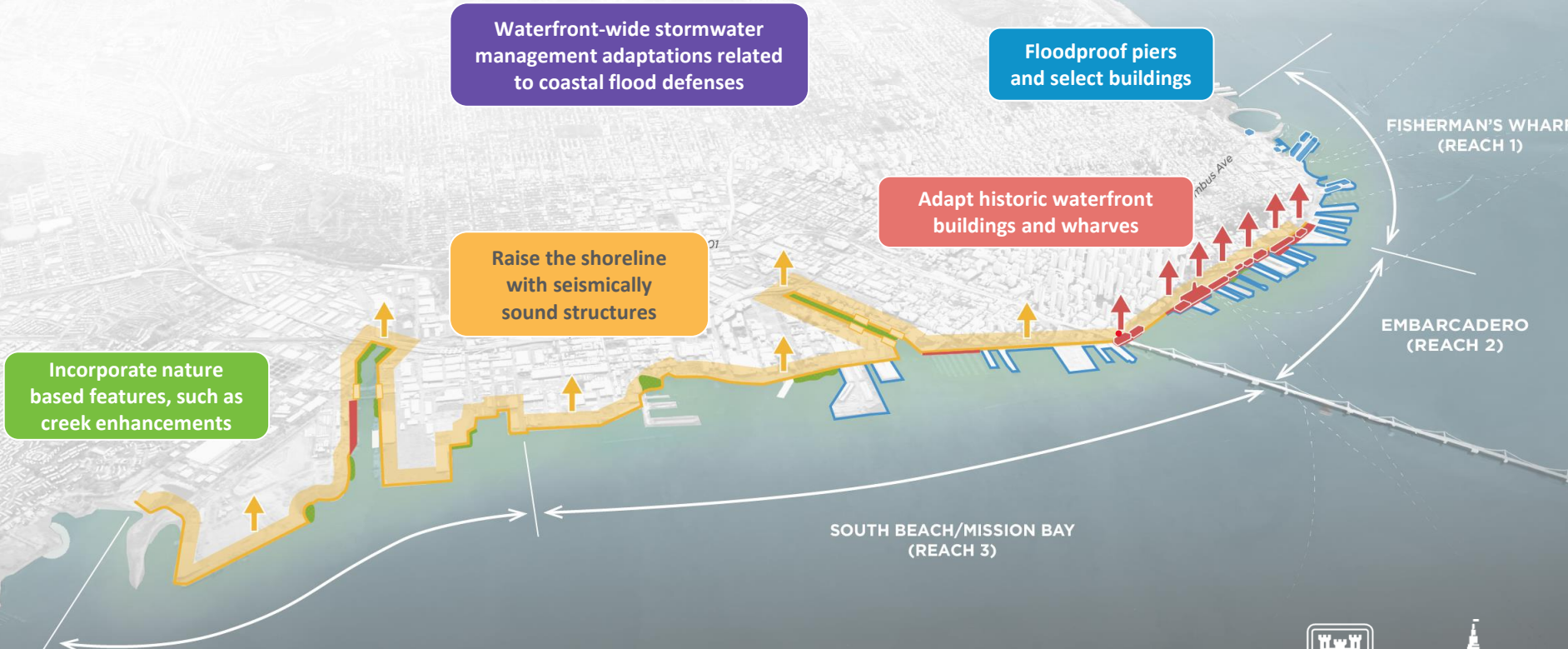
Expand (and maintain) the City's connection to the waterfront

Prioritize nature and healing the Bay

Consider racial and social equity and environmental justice



THE DRAFT PLAN



Waterfront-wide stormwater management adaptations related to coastal flood defenses

Floodproof piers and select buildings

Adapt historic waterfront buildings and wharves

Raise the shoreline with seismically sound structures

Incorporate nature based features, such as creek enhancements

FISHERMAN'S WHARF (REACH 1)

EMBARCADERO (REACH 2)

SOUTH BEACH/MISSION BAY (REACH 3)

ISLAIS CREEK/BAYVIEW (REACH 4)



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FISHERMAN'S WHARF: FIRST ACTIONS

Floodproofing structures

Embarcadero
Corridor

Add short walls
around the piers

Floodproof select buildings
along the water's edge

Existing
high ground

F Line

Existing breakwaters

AQUATIC PARK

REACH 1



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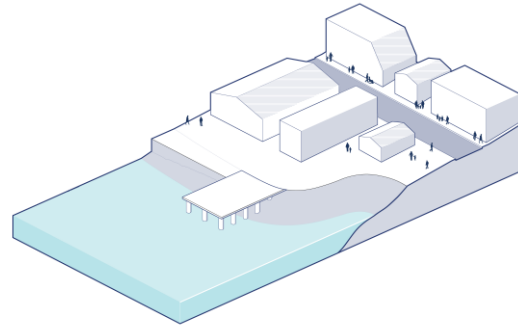
ACTIONS EXPLAINED

Floodproof select buildings

Some facilities can be modified to keep water out entirely, while others can be modified on the inside to allow water to enter and exit the facility, causing little or no lasting damage.

Add short walls around piers

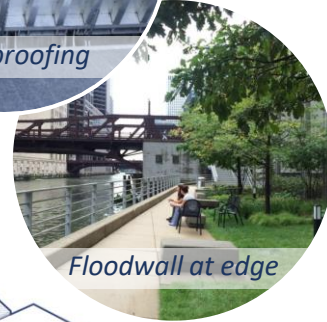
Build up to two-foot walls around piers to manage flood risks & defend against intermittent high water.



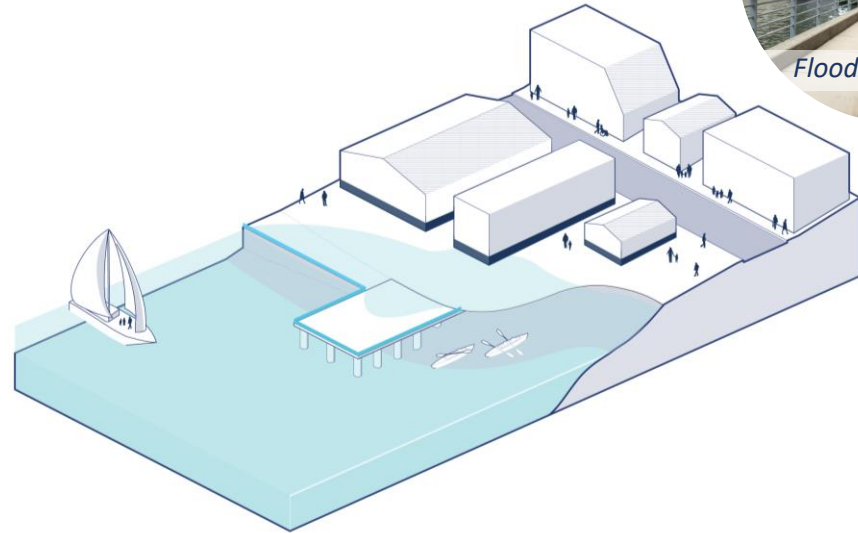
Current condition



Floodproofing



Floodwall at edge



Future condition

MOBILITY CONSIDERATIONS

Construction Disruption

Building improvements likely to take time, require space, and impact loading and roadway areas, including rolling/biking facilities and driving, with minimal transit disruption.

Permanent Changes

Retaining existing features



EMBARCADERO: FIRST ACTIONS

Defend against **3.5 feet** of sea level rise

Raise buildings along the water's edge and raise wharves

Embarcadero Station

Raise the shoreline and roadway with a gradual transition, designed to withstand a seismic event

Folsom Portal

FERRY BUILDING

Add short walls around the piers

RINCON PARK

← REACH 2



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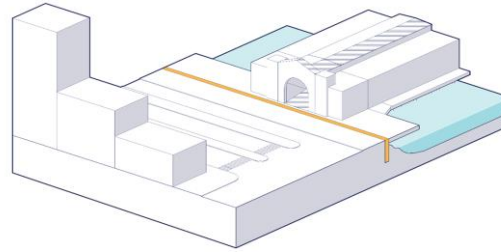


ACTIONS EXPLAINED

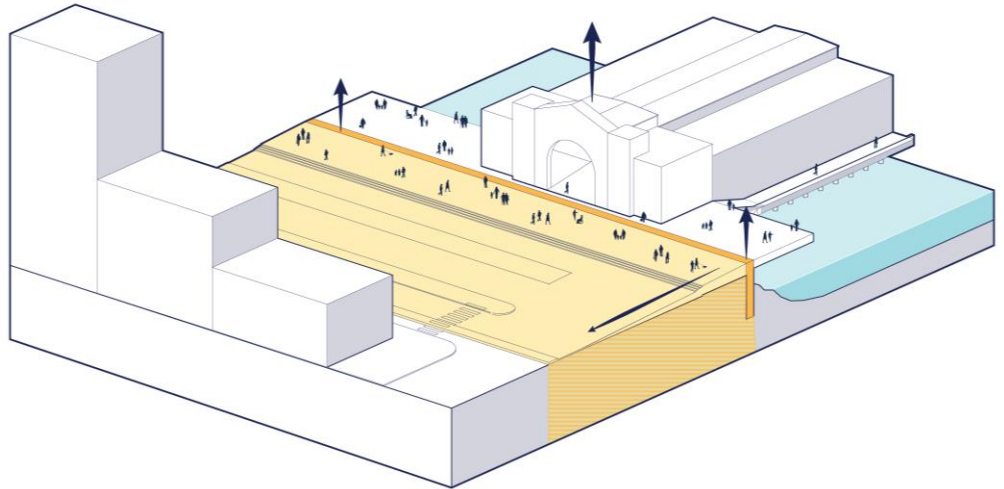
Raise the shoreline

This action will elevate the shoreline at the roadway edge and gradually slope back to existing city elevation. The action includes seismic improvements under the roadway to reduce seismic damages to flood defenses.

Elevating the shoreline presents an opportunity for new waterfront public spaces. Design details will be developed at later project phases.



Current condition



Future condition

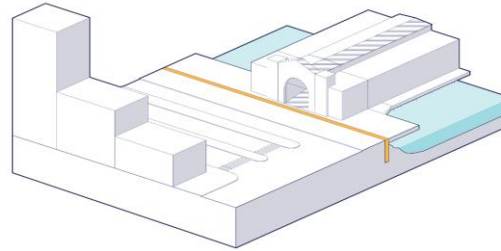
ACTIONS EXPLAINED

Elevate buildings and wharves

Elevate buildings and wharves along the water's edge, including the Ferry Building and historic bulkhead buildings. Enhance seismic stability for wharves and buildings.

Add short walls around piers

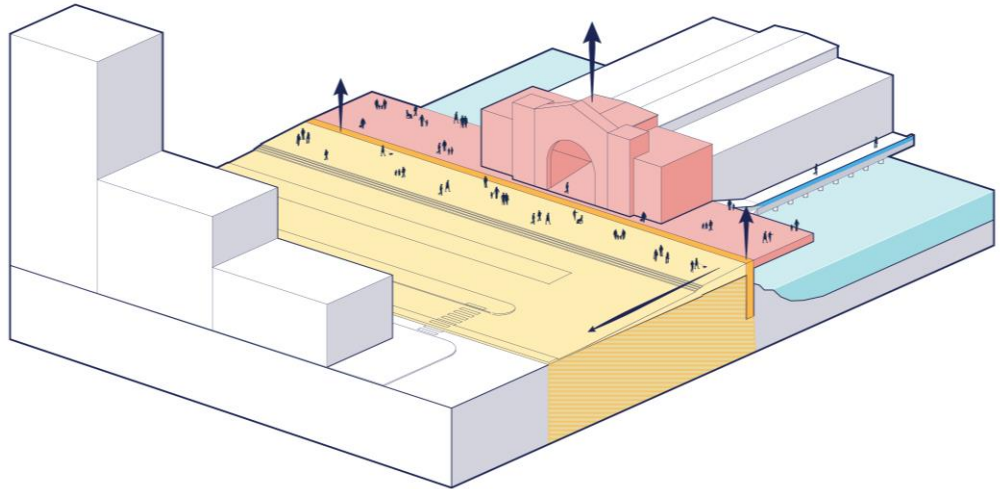
Build up to two-foot walls around piers to manage flood risks and defend against intermittent high water.



Current condition



Floodwall at edge



Future condition

MOBILITY CONSIDERATIONS

Construction Disruption

Substantial disruption to ferry access, transit and roadway system with the raising of the Ferry Building

Permanent Changes

New potential adjustments to roadway and transit with opportunities to improve access to Chinatown, Fisherman's Wharf, North Beach, South Beach through community process



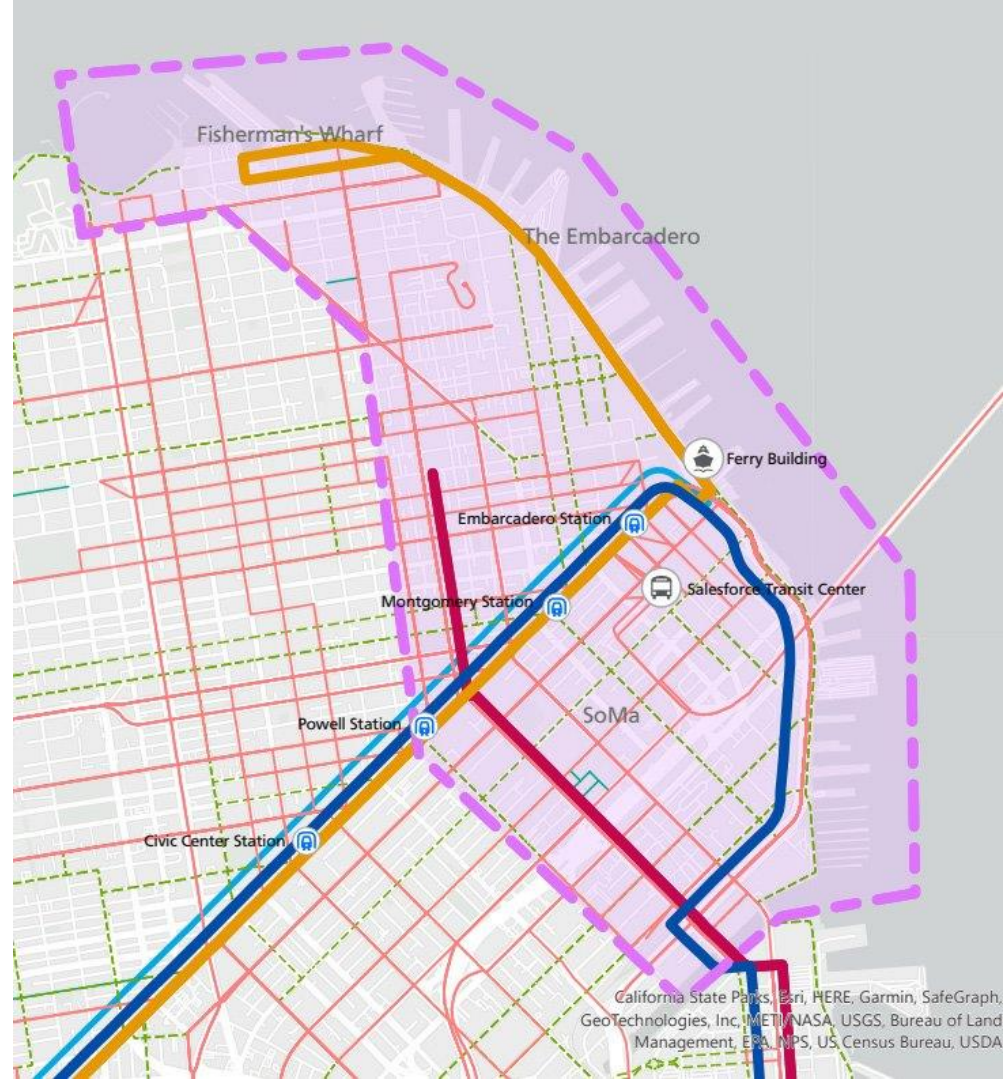
Embarcadero Mobility Resilience Plan

Protect, coordinate, connect, and improve transportation through end of century

A responsible next step to reduce impacts on and enhance benefits for adjacent businesses and communities

Renew a vibrant corridor to support the city's economic future

2024 to 2026 supported by \$1.3M in Caltrans funds



California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

SOUTH BEACH / MISSION BAY: FIRST ACTIONS

Elevate the shoreline to defend against 1.5 feet of sea level rise

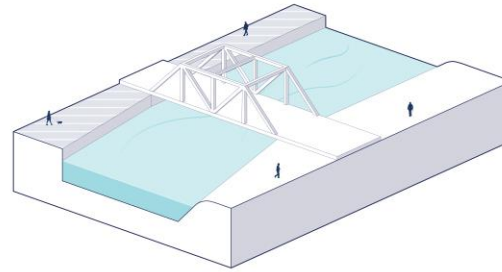


ACTIONS EXPLAINED

Closure structure on bridges

Closure structures on Third and Fourth Street Bridges will close gaps in the elevated shoreline to prevent flooding.

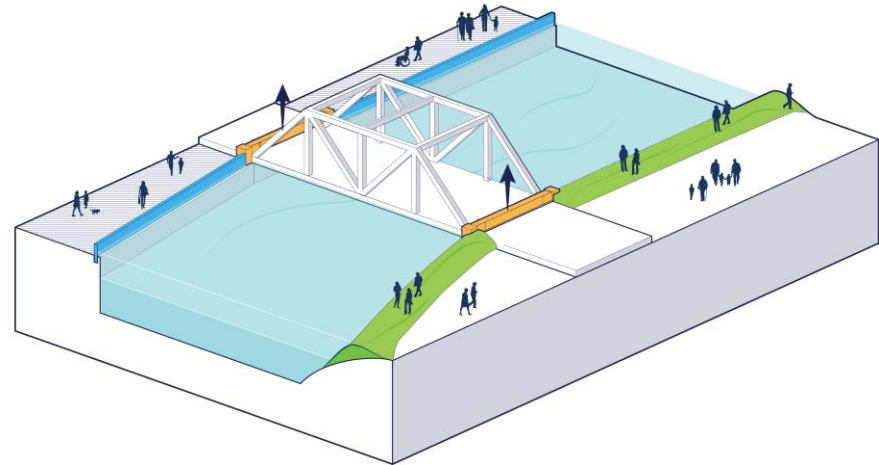
It is anticipated that these closures would be infrequent (less than once a year) and used in anticipation of a large storm or tide event.



Current condition



Closure Structure



Future condition

MOBILITY CONSIDERATIONS

First Phase Disruptions

Closure structures are not ideal given transit's reliance on bridge

Bridge Replacement

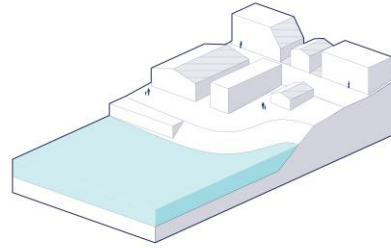
Prioritizing Fourth Street Bridge replacement and elevation essential for access to critical MTA southeast facilities, residents, and commerce



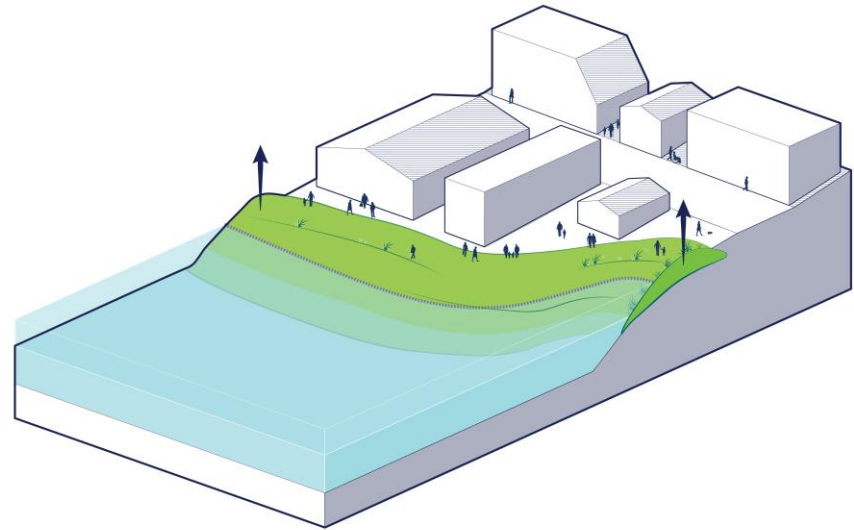
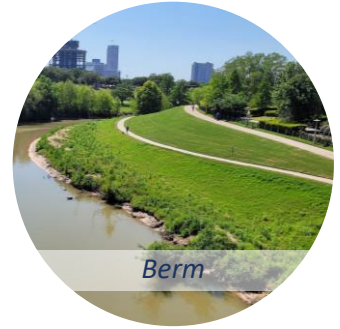
ACTIONS EXPLAINED

Berms + nature-based features

Berms are areas of raised ground that can help prevent flooding while maintaining waterfront access. They can include public space, such as walking or biking paths, and incorporate vegetation that support habitats.



Current condition



Future condition

MOBILITY CONSIDERATIONS

Existing Challenges

Islais Creek Facilities and Bayview neighborhood already face significant disruptions at stormwater events

Bridge Replacement

An elevated Islais Creek Bridge replacement in design stages

Implementing Community Planning

Prioritizing implementation of: the Bayview community-based transportation plan, Islais Creek Adaptation Strategy, and Yosemite Slough Adaptation Planning





4 Key Policy Considerations



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PHASING OF FIRST ACTIONS

First Actions will be built in phases.

The Draft Plan will be prioritized so not everything described will be done at once, and **will be built as funding is available**



Managing Risks and Expenditures over time

Prioritization factors could include:

- Level of Risk
- Equity
- Environmental clean-up considerations
- Complexity of design and construction
- Related investment opportunities
- Other factors

A CATALYST FOR A MORE RESILIENT SAN FRANCISCO

This is a once-in-a-century opportunity to:



Defend communities, assets, and infrastructure against coastal flooding



Improve earthquake safety related to flood protection projects



Invest in a great public waterfront along with flood protection projects



Safeguard resilient transit and utility networks



Secure funding through collaboration with the Federal government



Adapt historic and cultural resources to climate change

HERON'S HEAD



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5 Public Comment



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WE WANT TO HEAR FROM YOU

There are several ways that you can add a comment:

- Join USACE and the City for one of several **upcoming community workshops** being hosted along the waterfront. Each meeting will include the same presentation. Comment cards will be available, and a station will be set up to record verbal comments as well. Learn more at sfport.com/wrp.
- Share written comments via email: SFWFRS@usace.army.mil
- Share written comments via mail: U.S. Army Corps of Engineers, Tulsa District ATTN: RPEC-SFWS, 2488 E 81st St., Tulsa, OK 74137
- Share written comments online: learn more and comment online at sfport.com/wrp



To stay in touch, please sign up for the Port of SF's Waterfront Resilience Program **eNewsletter and mailing list** by visiting sfport.com and clicking the Signup for e-newsletter in the footer and selecting Waterfront Resilience Program from the list in the form provided.

Thank you

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Port of SF Waterfront Resilience Program | wrp@sfport.com



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