



# SAN FRANCISCO WATERFRONT FLOOD STUDY

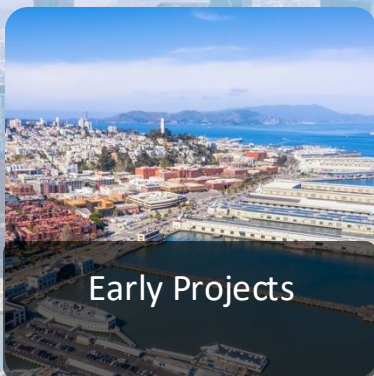
*Draft Plan and Lessons Learned*

**November 7, 2024**

*Storms, Flooding & Sea Level Defense 2024 Conference*



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.



Early Projects

Near-Term Actions



San Francisco  
Waterfront Flood Study

Long-Term Actions



Living Seawall  
Pilot

Pilot Projects

# WHAT IS THE FLOOD STUDY?

- The **Flood Study** analyzes **coastal flood risk** and the effects of **sea level rise** to the San Francisco waterfront along the Port's 7.5-mile jurisdiction over the next 100 years.
- The **Draft Plan** will inform subsequent stages of funding and design in order to develop targeted construction projects.
- The proposed solutions are estimated to cost **\$13.5 billion** (high-level, preliminary cost estimate) and, if approved by Congress, the Federal government may pay **65% of the cost**.
- The Flood Study is led by the **U.S. Army Corps of Engineers (USACE)** in collaboration with the **City of San Francisco**.



San Francisco Waterfront  
Flood Study



US Army Corps  
of Engineers



# 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

*San Francisco Waterfront Flood Study*

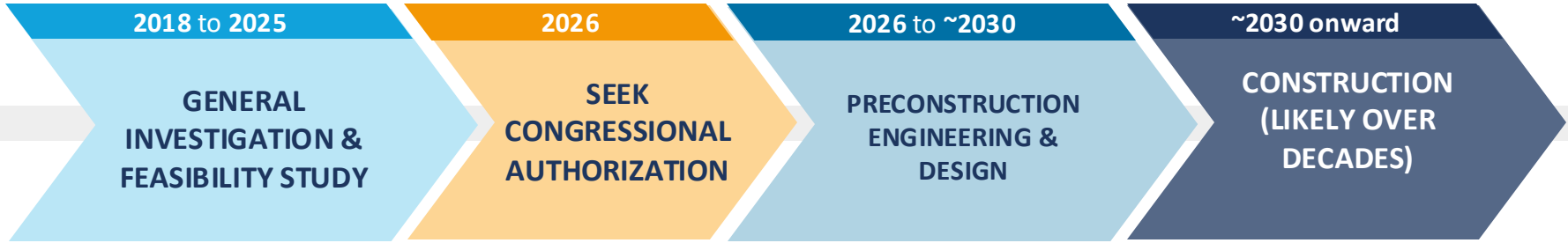


US Army Corps  
of Engineers



# 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 the project to Congress. Congress will then decide whether to authorize and fund the project.

## *What to expect*

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

## *What to expect*

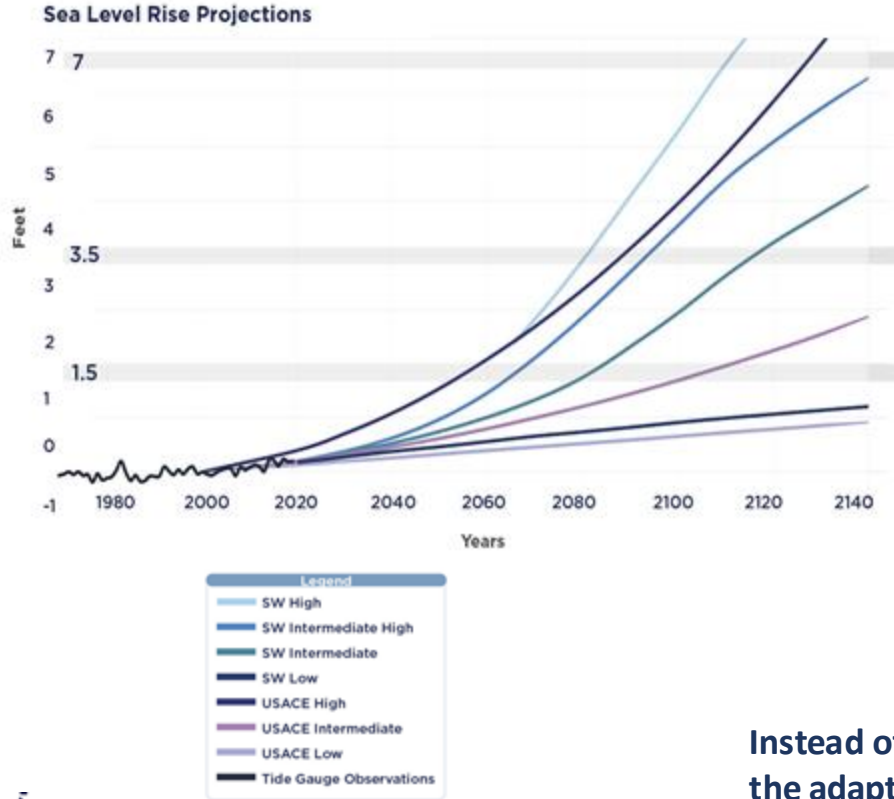
Phased construction of coastal flood defense infrastructure, related seismic stabilization, and other improvements



US Army Corps of Engineers

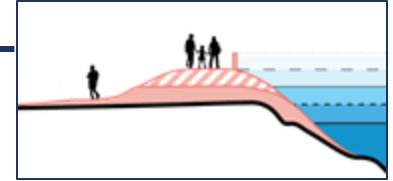
*Note: Dates are approximate and subject to change. Projects will occur in phases which will extend over decades.*

# CONSIDERATIONS OF SEA LEVEL RISE IN PLANNING



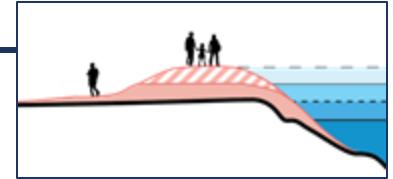
End of century adaptation actions respond to up to:

7 Feet Sea Level Rise

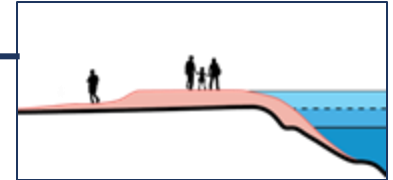


1<sup>st</sup> adaptation actions respond to either:

3.5 Feet Sea Level Rise



1.5 Feet Sea Level Rise



Instead of choosing a single SLR projection to support planning, the adaptive management plan must respond to all scenarios. G2CRM includes typical Bay storms and concurrent waves.

# ADAPTATION STRATEGIES – DEFEND, ACCOMMODATE, RETREAT

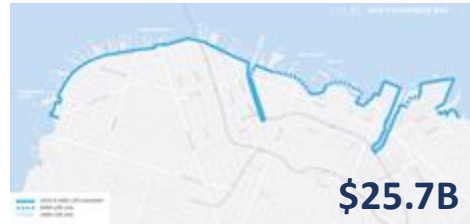
Strategy A – No action

Takes *no actions* to reduce flood risks beyond projects that are already approved.  
**\$0B**

Strategy C



Strategy E



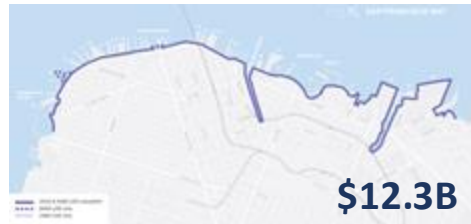
Strategy G



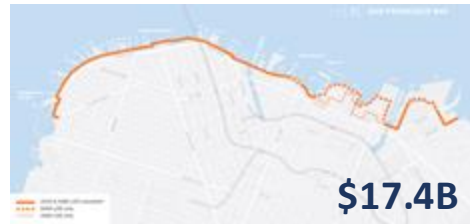
Strategy B - Floodproofing



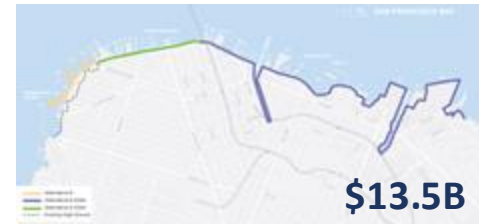
Strategy D



Strategy F



Total Net Benefits Plan (TNBP)



- Alternatives scaled to address either low/intermediate SLR or high SLR
- Each alternative included combinations of measures responding to shoreline typologies, foundations to address weak soils, quantities and cost estimates.

# NATURAL AND NATURE-BASED FEATURES (NNBFS)

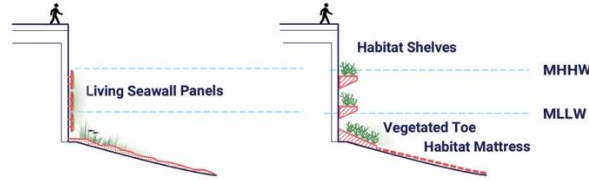
Included in EIS Report

- Key Benefits:**
- Habitat
  - Wave Energy Dissipation
  - Erosion Mitigation
  - Inland Flood Risk Mitigation

*Coarse Beach*



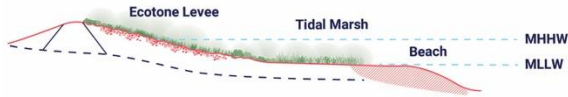
*Living Seawall*



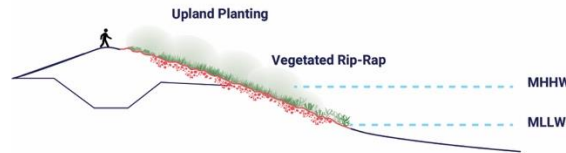
*Wetland Creation*



*Ecotone Levee*



*Embankment Shoreline*



*Enhancement of Existing Wetlands*



*Ecological Armoring*



*Naturalized Shoreline*



*Creek Enhancements*

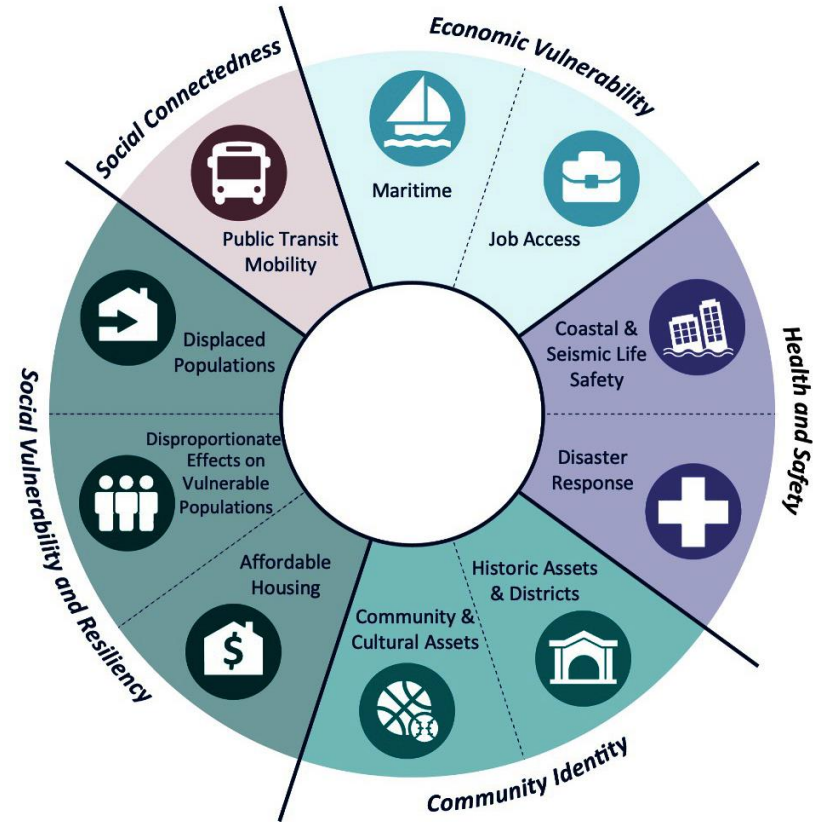




# A COMPREHENSIVE COST BENEFIT ANALYSIS THAT ELEVATES EQUITY

Historically, plan selection maximizes NED national economic benefits. This plan incorporates analysis across four categories:

- + National Economic Development (including damages prevented, cost of construction)
- + Regional economic impacts (including jobs)
- + Environmental quality, consequences, and compliance (including pollution)
- + **Other social effects (including disproportionate effects on vulnerable populations)**

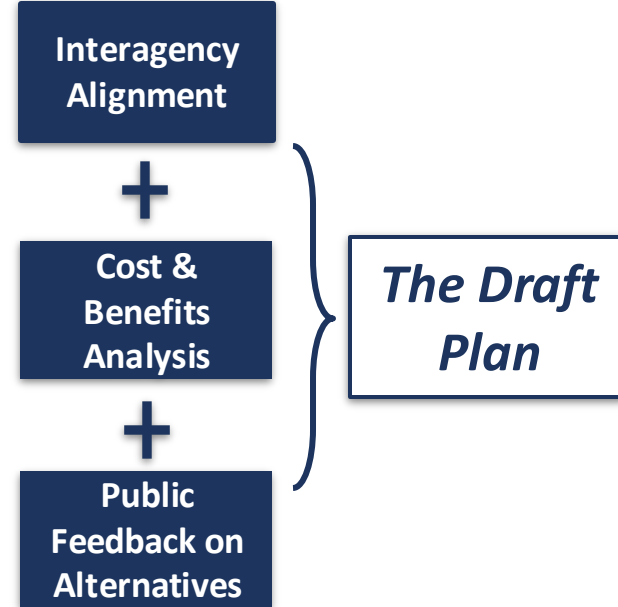
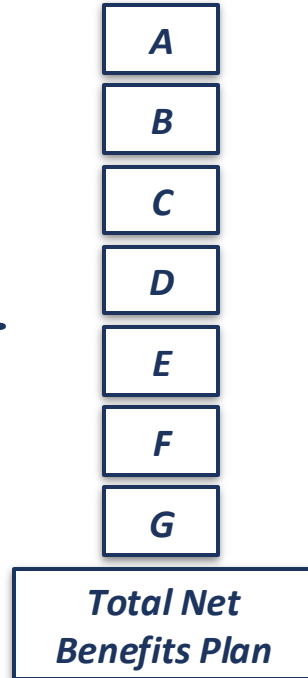


*Other Social Effects (USACE Analysis) data included in Alternative Selection*

# GETTING TO THE DRAFT PLAN

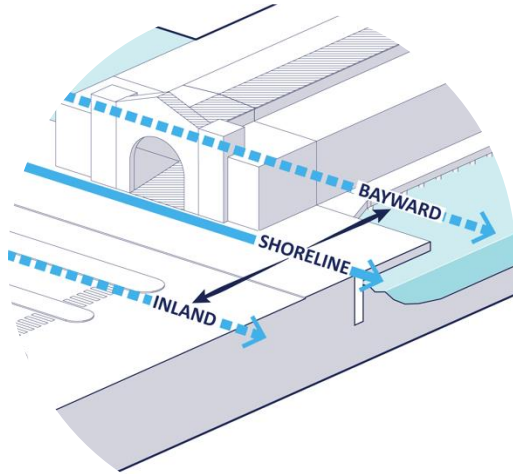


## Strategies



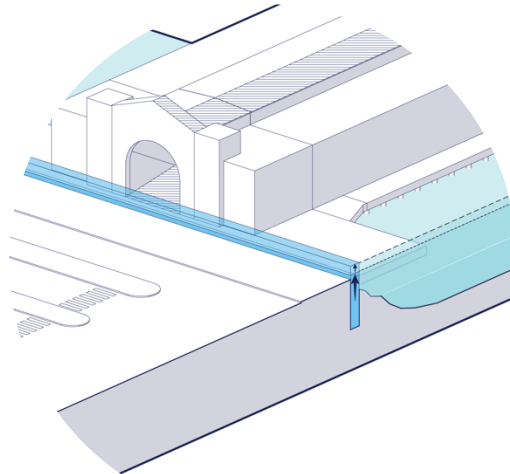
# WHAT IS IN THE DRAFT PLAN?

*Where* to build flood defenses



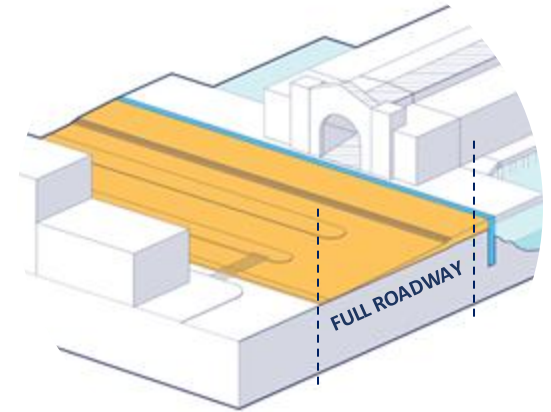
*Have we located the flood defenses in the right place?*

*How high* to build flood defenses



*Should we invest in higher levels of flood defense 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*

# THE DRAFT PLAN



# COMMUNITY-DRIVEN RESILIENCE

Connected with **tens of thousands** of people since 2017



- Desire for **nature-based solutions**
- Desire for **recreational uses**
- Opportunities for **local workers & businesses.**
- Concerns about contamination and groundwater flooding.
- Concerns areas of the waterfront not included in the Draft Plan, particularly in the southeast.
- Questions about funding, phasing, and construction impacts

# SAN FRANCISCO IS AN ICONIC, BELOVED WATERFRONT CITY



# Thank you

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