MEMORANDUM

November 5, 2021

TO: MEMBERS, PORT COMMISSION
Hon. Kimberly Brandon, President
Hon. Willie Adams, Vice President
Hon. John Burton
Hon. Gail Gilman
Hon. Doreen Woo Ho

FROM: Elaine Forbes
Executive Director

SUBJECT: Informational presentation regarding the framework for Waterfront Resilience Program Early Projects

DIRECTOR'S RECOMMENDATION: Information Only - No Action Required

INTRODUCTION

The Waterfront Resilience Program team will present early projects along the Embarcadero to improve life safety and disaster response (Early Projects) in our December presentation to the Port Commission, including those we recommend advancing with Proposition A Embarcadero Seawall Earthquake Safety Bond (2018) funds. This report describes the planning framework and process developed by Port staff to identify and evaluate Early Projects in the Embarcadero Seawall zone. These Early Projects are the foundation for the Waterfront Resilience Program and represent the Port's first step in reducing seismic risk and preparing for seal level rise. The entire effort will require billions.

This report also describes next steps in the Port's long-range planning efforts to plan, design and construct coastal flood defenses for San Francisco through engagement with City agencies over the next 5-6 months to develop a coordinated approach to planning and designing resilient infrastructure. The Port is coordinating this effort with:

- the City Administrator's Office of Resilience and Capital Planning
- San Francisco Public Utilities Commission (SFPUC)
- San Francisco Public Works (Public Works)
- San Francisco Municipal Transportation Agency (SFMTA)
- San Francisco Planning Department (SF Planning)
- San Francisco Department of Emergency Management (SFDEM)

- San Francisco Department of the Environment (SFE)

Coastal risk and damage analyses that support the U.S. Army Corps of Engineers (USACE) San Francisco Waterfront Coastal Study predicts increasing coastal storm risk between now and 2040, and beyond, in key areas of the waterfront along the Embarcadero, Islais Creek / Bayview, and Mission Creek / Mission Bay. These impacts are occurring sooner than we previously expected.

While the billions of dollars in funding to make the entire Port waterfront resilient to earthquakes and flooding is daunting, those costs are substantially less than the estimated $30 billion in damages and disruption from earthquakes and flooding that the Embarcadero Seawall MHRA predicts for the northern waterfront alone.

Fortunately, we also have once-in-a-generation funding opportunities through such sources as the Federal Infrastructure Bill ($47 billion for resilience investments alone) and the historic California FY 2021 budget ($4.7 billion for climate resilience investments over three years). The timing is right for the Port and the City to invest in a new shoreline that will be resilient to earthquakes and future flood risks[1].

STRATEGIC OBJECTIVES

The Port's Waterfront Resilience Program supports the goals of the Port's Strategic Plan as follows:

Engagement
By leading an inclusive stakeholder process to develop a shared vision, goals, and principles for the Waterfront Resilience Program and Flood Study.

Livability
By increasing the proportion of funds spent by the Port on contract services performed by LBE firms.

Resiliency
By leading the City's efforts to address threats from earthquakes and flood risk through research and infrastructure improvements to the Embarcadero Seawall and adjoining buildings and other infrastructure.

Sustainability
By enhancing the quality of the Bay water and habitat with the improvements, by limiting construction impacts and waste, and by sustainable design and construction best management practices.

Financial Stability
Through wise investment of Proposition A Seawall Earthquake Safety Bonds.

[1] The Embarcadero Seawall Multi-Hazard Risk Assessment (MHRA) included a probabilistic analysis of earthquake and flood damages to Port facilities, City infrastructure and public and private property within 1) the Seawall zone of influence, and 2) the future floodplain. The MHRA study period extended through 2100.

MHRA Staff Report:
https://sfport.com/meetings/san-francisco-port-commission-september-22-2020

REVIEW OF FLOOD AND SEISMIC RISKS

Embarcadero Seawall MHRA

The Waterfront Resilience Program published the Embarcadero Seawall MHRA in September 2020. Key findings from the report include:

- Seawall earthquake risk is high north of the Bay Bridge and moderate to low in South Beach, except for a hot spot near the Ballpark (which does not impact seismic performance of the Ballpark itself).

- Earthquake risk is very high in most bulkhead wharves (including seismically retrofitted facilities), moderate in piers, and low where piers have been retrofit or replaced. The bulkhead wharves are directly connected to the Seawall and provide flood risk reduction to the City today.

- The Agriculture Building and wood pile-supported structures in Fisherman's Wharf are vulnerable to both ground shaking and lateral spreading. Some older waterfront structures are vulnerable to ground shaking in earthquakes whether or not the Seawall adjacent to these structures moves bayward.

- Earthquake risk to The Embarcadero Roadway is due to a combination of Seawall instability and liquefaction of the ground beneath The Embarcadero. Widespread and damaging liquefaction is expected to occur at earthquakes larger than 1989 but smaller than 1906. Damage is expected to both the Roadway, SFMTA light rail and local telecommunication, gas, electric and water lines within the roadway. In larger earthquakes, significant damage is expected to northbound lanes of the Embarcadero – particularly in the area from the Ferry Building north to Fisherman's Wharf which are areas with high lateral spreading risk.

  The Port has worked closely with other City and regional transportation and utility providers on the MHRA and these agencies have reviewed and commented on the MHRA results for the Embarcadero and transit and utility infrastructure in the Roadway. More interagency coordination is needed to determine next steps for this vital corridor.

- Flood risk is highest between Rincon Park and Pier 7, centered on the Ferry Building area. The Ferry Building area is the entry point for water and that flooding extends along the Embarcadero Roadway.

- With no action, we could see up to $30 billion in present value damages by 2100 for the Embarcadero Seawall area of the waterfront.

USACE Flood Study – Future Without Project

As part of the USACE Flood Study, the Port is finalizing flood modeling work that is undergoing *agency technical review*, which will be completed by early next year. The team is seeing significant, projected coastal flood damages in the period leading up to 2040 – earlier than previously expected.

With one foot of sea level rise, during a 100-year flood event, the foot of Market Street will be significantly inundated, disrupting Embarcadero traffic, damaging buildings and businesses and potentially causing severe impacts to over 1 million trips taken by BART and Muni riders.

Port-wide, this flood modeling shows significant flood risks that will impact:

- 13,500 residents, over 58% of whom are projected to be people of color
- Wastewater functions serving 580,000 residents
- 360,000 regional commuters
- 11,000 jobs
- 2,600 residential and commercial buildings
- 40+ miles of roadway
- 25+ miles of Muni and cable car tracks

Disaster Response Exercise

This Summer, the Port of San Francisco and SFDEM collaborated to host a Disaster Response Exercise (DRX*)*. The DRX was a virtual tabletop exercise conducted as part of the Waterfront Resilience Program*.* The discussion-based exercise focused on identifying gaps, resources, and planning assumptions to guide Port prioritization of investments along the Seawall Program area. Specific focus and attention were also given to educating Port stakeholders regarding the Seawall Program and MHRA results, as well as the ongoing initial Southern Waterfront Earthquake Assessment. The Waterfront Resilience Program engineering team developed a 1906 earthquake scenario – typical for Bay Area earthquake exercises – with damage projections for the entire waterfront to inform the exercise.

From June 18 – July 2, 2021, the Port and DEM hosted a series of 10 virtual discussion groups facilitated by the Port's planning, environmental and engineering consulting team. 115 participants representing 64 agencies participated in the exercise, including the Federal Emergency Management Agency, California Office of Emergency Services, the Water Emergency Transportation Agency.

The findings were issued to the Port and SFDEM. Findings included recommendations to 1) update Port, City, regional and other emergency response plans and 2) invest to secure functional access to and operability of key disaster response assets along the waterfront. Findings that informed the development of Early Projects included:

- Universal access to the Ferry Building area and the WETA Downtown Ferry Terminal is a priority to facilitate return of Disaster Service Workers to the City after an earthquake and to allow workers to return to the East and North Bay after an event.

- Access to the Port's deep water berths will be critical in both the northern and southern waterfront.

- The Emergency Firefighting Water System provides key access to Bay water in the event of damage to the domestic water supply system.

- The Port's personnel and equipment at Pier 1 and Pier 50, including inspection and maintenance staff, will play a critical role in waterfront recovery.

- North-south access along the Embarcadero for emergency vehicles and access across the Embarcadero will be a priority to facilitate response, including moving of equipment, people and supplies.

ADAPTATION STRATEGIES & EMBARCADERO EARLY PROJECTS

Relying on the information developed over the past 3 years, Port staff, in conjunction with staff from Port divisions, has worked over the last eight months to develop adaptation strategies for the entire northern waterfront (South Beach, Ferry Building Area, Northeast Waterfront, and Fisherman's Wharf).

Using this information, the team is identifying potential locations for a **Line of Defense** for a city flood defense system (where to stop coastal flood waters from flooding the City), **Adaptation Zones** across which elevation can be gained to meet a higher shoreline elevation, and seismic strategies to reduce earthquake risks. Design variants are being evaluated to test feasibility, explore tradeoffs, and assess how adaptation to higher water levels could be achieved.

Core components of these adaptation strategies will include:

- the timing of major interventions;
- Early Projects – near-term investments such as seismic retrofits, improvements to disaster response facilities, shoreline stability projects or near-term flood risk reduction projects;
- a line of defense and adaptation zone (the extent of landward or Bayward adaptation) for future flood defenses;
- the earthquake risk reduction strategy for shoreline, transportation and utility infrastructure; and
- policies.

Building on recent resilience work in Mission Creek and Islais Creek/Bayview, including the Islais Creek Southeast Mobility and Adaptation Strategy work presented in May 2021[2], Port staff will continue this adaptation strategy work in the Port's Southern Waterfront (Mission Creek to Heron's Head Park) beginning in January 2022.

Through this process, Port staff identified a list of more than 20 Embarcadero Early Projects to address the most urgent life safety and disaster response risks that can be delivered with Proposition A or other early Program funding, including investments by long-term tenants with substructure responsibility, by other City agencies with at-risk infrastructure or by the Port through its own Capital Improvement Program.

At the December 2021 Port Commission meeting, Port staff will return to present recommendations for Early Projects to advance into project design. Due to low level of design at this early stage, the potential range of project costs for Early Projects exceeds $2 billion, which is well beyond the Port's remaining Proposition A Seawall Earthquake Safety Bond resources. Prioritization is necessary.

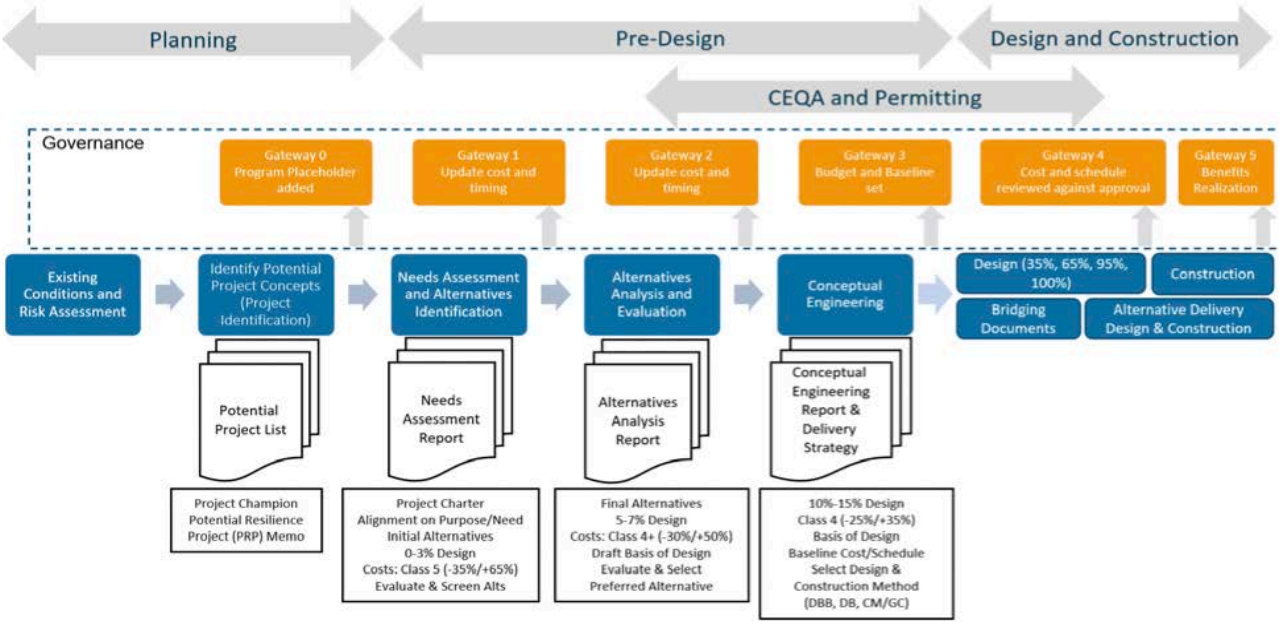
The December 2021 Port Commission presentation, staff will describe the process for identifying Embarcadero Early Projects and evaluating those projects against evaluation criteria in five major categories: feasibility and performance, society and equity, economic and financial,

[2] Staff Report:
https://sfport.com/meetings/san-francisco-port-commission-may-25-2021

environmental, and government and partnerships. Staff will make recommendations about which projects to advance through a structured predesign process, which will enable Port executive management and the Commission to make informed decisions at a later date regarding which projects to advance to final design and construction. In August 2021, Port staff presented the structured process through which we intend to advance projects[3]. The Project development process includes the following major steps:

- Project Planning and Pre-Design
- Design & Construction
- Closeout

As each project stage is completed the project will pass through a gateway, as shown in Figure 1. These gateways provide the link back to the program overview and provide governance. Staff will provide updates to the Port Commission on overall program and project schedule, budget, and risks at regular intervals.



In December 2021, Port staff will recommend a series of projects to advance into this process utilizing Proposition A funding. The Port Commission will be able to make subsequent decisions about which projects to advance to detailed design and construction, based on more refined cost estimates, constructability reviews, and project design developed through conceptual engineering to support those decisions.

ADAPTATION STRATEGIES AND CITY DEPARTMENT AND RESOURCE AGENCY ENGAGEMENT

[3] Staff Report: https://sfport.com/files/2021-08/Item%209A%20Waterfront%20Resilience%20Program%20Project%20Delivery_final.pdf

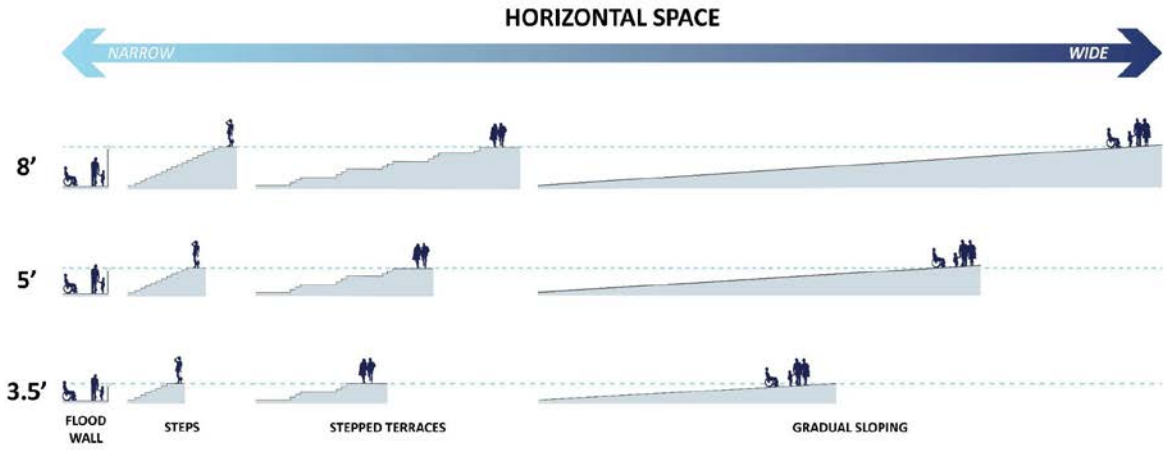
The scope and scale of work required to improve the seismic safety of the Embarcadero waterfront means that we should also be accounting for coastal flood risk and preparing for sea level rise to minimize disruption to the waterfront and maximize public benefit with a "dig once" approach.

Following guidance issued by the State of California through the Ocean Protection Council and FEMA guidance, the Port team is developing coastal flood risk reduction guidance to inform planning and design of future coastal flood defenses.

The Port's current Embarcadero shoreline has an average elevation of 10' to 13' NAVD 88[4]. The lowest shoreline elevation along this stretch of waterfront is 8.1' NAVD 88 at Pier 14, just south of the Ferry Building. Based on our analysis of projected sea level rise, state and City sea level rise guidance, and FEMA requirements for coastal flood defense systems, we are examining adaptation strategies that would elevate the shoreline to 15' NAVD 88 and be adaptable to 18.5' NAVD 88 (or potentially be constructed to that elevation, depending on when these improvements are constructed). To defend downtown San Francisco from future flood risk from sea level rise, this represents a need to increase shoreline elevations from 2 to 7 feet or more along the Embarcadero (depending on the current elevation of the shoreline, which varies by location).

San Francisco has a unique relationship with the San Francisco Bay. Our experience with the removal of the elevated Embarcadero Freeway structure has created a strong desire for connection to the Bay. To respect that relationship, Port staff is developing long-term adaptation strategies that would gain elevation over space, instead of installing flood walls along the Embarcadero. As shown in Figure 1, the need to gain elevation over space requires a large adaptation zone.

Figure 1: Gaining Elevation Over Space



<u>City Department and Regulatory Agency Engagement</u>

[4] North American Vertical Datum 1988 is the standard measure of elevation in North America. Here are some representative elevations:

Current High Tide: >6' NAVD 88
Current 1% Extreme Tide: >9' NAVD 88
Lowest Shoreline Elevation (Pier 14): 8.1' NAVD 88 = **current flood risk along the Embarcadero.**

The need for space to gain elevation to a higher shoreline to defend the City from higher water levels, coupled with seismic risk to key City infrastructure in the Embarcadero and elsewhere along the waterfront, requires a coordinated City approach to planning for future coastal flood defenses and adaptation of critical infrastructure.

In August and September of this year, Port staff initiated engagement with sister City agencies to inform planning for these future coastal defenses. The goal of this effort is to:

- Review the findings from the Multi-Hazard Risk Assessment, with a focus on damages to transportation and utility assets and resulting consequences, and determine recommended next steps from sister City agencies;

- Invite City departments to participate in the development of the phased seismic and flood resilience strategies that will inform Flood Study, including geographic adaptation strategies;

- Solicit input on draft coastal flood risk reduction guidelines for Port property and align on a preferred plan for coastal flood defenses; and

- Invite City departments to collaborate on the first early projects to improve life safety and the City's earthquake disaster response, including Proposition A projects.

Port staff believes that projects to reduce seismic and flood risk along the Embarcadero and in the Port's southern waterfront should preserve and reduce risk to existing assets and services provided by SFMTA, Public Works, and SFPUC and incorporate the policy objectives of Planning, SFDEM and SFE.

PUBLIC ENGAGEMENT

As the team continues to advance this critical planning and engineering effort, we've continued to focus on digital engagement in support of public health and safety. Over the summer, Port staff scheduled presentations with 30 community-based organizations, reaching more than 700 community members, including youth and in-language presentations.

Some of the key feedback we continued to hear from community members included:

- Equity – we should prioritize access to contracts/jobs and resilience improvements to historically vulnerable populations and areas of the City;

- Citywide & regional coordination – community members wanted assurance that the Port is working with other City departments and regional bodies as this problem extends beyond Port property;

- How can we help? - individuals or organizations are eager and willing to support the Port's work and help move the Program forward; and

- Monitor and minimize health impacts to ecosystems and communities during construction.

There is exciting engagement to come, with planning our first in-person outreach at outdoor community events this Fall. The team is aiming to engage in late Spring 2022 to further inform the work under the USACE Flood Study.

WATERFRONT RESILIENCE PROGRAM EXPENDITURES TO DATE

Table 1 below shows Waterfront Resilience Program expenditures as of October 30, 2021.

Table 1: Waterfront Resilience Program Expenditures to Date
Proposition A Seawall Earthquake Safety Bond and Other Sources

Category	Proposition A	Other Sources*	Total
Port Staffing	$3,774,967	$844,536	$4,619,503
Program Management	$7,063,755	-	$7,063,755
Multi-Hazard Risk Assessment	$7,619,655	$3,219,119	$10,838,774
Stakeholder Engagement	$2,553,709	$1,502,707	$4,056,416
Workforce Development and LBE Support Services	$238,693	-	$238,693
Planning	$3,271,050	$5,782,457	$9,053,507
USACE Work-in-Kind	$1,725,230	-	$1,725,230
Other City Depts/Fees/etc.	$81,750	$665,544	$747,294
Subtotal Direct Expenditures	**$26,299,195**	**$12,014,363**	**$38,313,558**
Port Cash Contributions to USACE Flood Study	-	$990,000	$990,000
Total Expenditures	**$26,328,809**	**$13,004,363**	**$39,333,172**

*Other Sources are Port Harbor Funds and $5 Million State of California Grant

NEXT STEPS

Port Executive Management, Port staff and Real Estate and Maritime staff will use the period until the December Port Commission presentation to reach out to City policymakers and leaders and Port tenants to share draft recommendations for priority Early Projects. We look forward to the public discussion regarding these critical investments.

Prepared by: Brad Benson, Waterfront Resilience Director