



MEMORANDUM

December 8, 2023

TO: MEMBERS, PORT COMMISSION
Hon. Kimberly Brandon, President
Hon. Willie Adams, Vice President
Hon. Gail Gilman
Hon. Ed Harrington
Hon. Steven Lee

FROM: Elaine Forbes
Executive Director 

SUBJECT: Informational presentation regarding the professional services contract with CH2M HILL Engineers, Inc., for planning, engineering, and environmental services for the Waterfront Resilience Program (WRP).

DIRECTOR'S RECOMMENDATION: Information Only – No Action Required

INTRODUCTION

This report provides an overview of program management, planning, engineering, environmental services, and communications contract (PMPEC Contract) with CH2M HILL Engineers, Inc., (CH2M) and the need to procure a new program management contract for the Waterfront Resilience Program (WRP).

Through September 2023, the Port has authorized \$59,261,272 in task authorizations to CH2M from the \$59,977,071 not-to-exceed contract amount and has paid CH2M \$51,344,992 with 28.25% (\$14,505,602) paid to LBE firms. The Port and CH2M continue to advance the Embarcadero Early Projects, Adaptation Strategies, and the U.S. Army Corps of Engineers (USACE) San Francisco Waterfront Coastal Flood Study (Flood Study). Under current CH2M expenditure projections, contract funding will be exhausted by June 2024.

Port staff is now preparing to seek Port Commission authorization to advertise a new competitive solicitation for WRP program management and related services, expected in the first quarter of 2024. Today's discussion is intended to provide the Port Commission and the public with important background information on the history of this important contracting relationship to elicit feedback that will help shape the next competitive solicitation.

This report is structured as follows:

- **Strategic Objectives**
- **Waterfront Resilience Program Background**
- **PMPEC Contract – Original RFP, Scope, and Funding Sources**
- **2019 Amendment to PMPEC Contract & Scope**
- **Contract Controls**
- **PMPEC Deliverables and Contract Expenditures**
- **RDJ Enterprises, LLC**
- **PMPEC Contract Remaining Capacity and Active Authorized Tasks**
- **Conclusion**

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, principles, and goals for the WRP and Flood Study.

Equity:

By developing a program-wide equity strategy that is integrated into the Port's Racial Equity Action Plan, and evaluating Draft Strategies and the Draft Plan through an equity lens to ensure that benefits accrue to, and burdens are minimized for Black, Indigenous, and People of Color (BIPOC) communities, and by increasing the proportion of funds spent on contract services performed by LBE firms. The Flood Study analyzes social impacts and disproportionate impacts on vulnerable communities in the evaluation of the Draft Strategies and the development and selection of a Draft Plan.

Resiliency:

By leading the City's efforts to address threats from earthquakes and flood risk through research and infrastructure improvements to the entire Port shoreline and adjoining buildings and other infrastructure.

Evolution:

By developing strategies to adapt the waterfront and its uses over time, and recognizing that decisions made today influence the options available to future generations who will be addressing different environmental and social conditions.

Sustainability:

By incorporating nature-based features to enhance the quality of the Bay water and habitat with the improvements and conducting an Environmental Quality analysis that considers environmental benefits and impacts in the evaluation of the Draft Strategies and development and selection of a Draft Plan.

Productivity and Economic Recovery:

Through the investment of Proposition A Seawall Earthquake Safety Bond funding and other Port and public funding sources, and by developing strategies to defend or floodproof Port maritime and industrial facilities to extend their useful life and reduce their risk from coastal flooding and sea level rise.

WATERFRONT RESILIENCE PROGRAM BACKGROUND

Early Milestones:

Based on prior analysis of the seismic performance of the Embarcadero Seawall during the design of the Brannan Street Wharf and the Pier 43 Bay Trail, the Port's Engineering Division led investigations of earthquake risk from 2014 to 2016, based on then available data. That work resulted in the July 2016 publication of the Earthquake Vulnerability Study of the Northern Waterfront Seawall which indicated significant lateral spreading and liquefaction risk along the Embarcadero, significant damage from seawall movement in a large earthquake, and a preliminary range of techniques to address the risk.

That study resulted in the following recommendations:

- The Port should stabilize or rebuild the 3-mile Embarcadero Seawall with an estimated cost range of \$2-5 billion;
- This work should start with a \$500 million first phase which would likely identify a 1/2-to-2/3-mile segment (or combination of segments) which would be identified based on analysis of earthquake risk, condition, and related factors; and
- The Port should pursue a general obligation bond, first sized at \$350 million and later increased to \$425 million, to fund the majority of this work.

In 2016, the USACE San Francisco District completed a draft federal interest determination report under the USACE Continuing Authorities Program (Section 103) resulting in a recommendation to enter a Feasibility Cost Sharing Agreement with the Port to study coastal flood risk in the Ferry Building area (CAP103). USACE CAP103 projects are smaller flood control projects with a \$15 million cap on construction costs.

On March 14, 2017¹, the Port Commission authorized staff to advertise a competitive solicitation for a contract for program management, planning, engineering, environmental,

¹ For a copy of this Staff Report, please see:

<https://sfport.com/meetings/san-francisco-port-commission-march-14-2017>

and communications services contract. On August 8, 2017², the Port Commission authorized the award of the PMPEC Contract to CH2M for a period of up to ten (10) years in the amount of \$39,984,714 including contingency, with a Port option to extend the term by up to one year.

In 2018, the following key actions occurred:

- The 2018 Water Resources Development Act authorized a general investigation to evaluate coastal storm risk along the full bayside waterfront – one of only two coastal flood general investigations authorized nationally in 2018. General investigations do not have a cap on overall design and construction costs. The CAP103 study was subsequently put on hold indefinitely.
- The Port and USACE entered a feasibility cost-sharing agreement to collaborate on and split the costs of a \$3 million, 3-year general investigation of coastal flood risk; and
- San Francisco voters approved Proposition A, the Seawall Earthquake Safety General Obligation Bond in an amount up to \$425 million, by a margin of 83-17%.

In early 2019, Executive Director Forbes established the Waterfront Resilience Program in the Port's executive division to address earthquake and flood risk along the Port's entire 7½ mile jurisdiction.

Changes in Early Program Assumptions:

Through work executed under the PMPEC Contract, several early assumptions that informed Program design and the design of the PMPEC Contract – all of which were reasonable at the time – either proved to be incorrect or evolved as we learned more by executing the work:

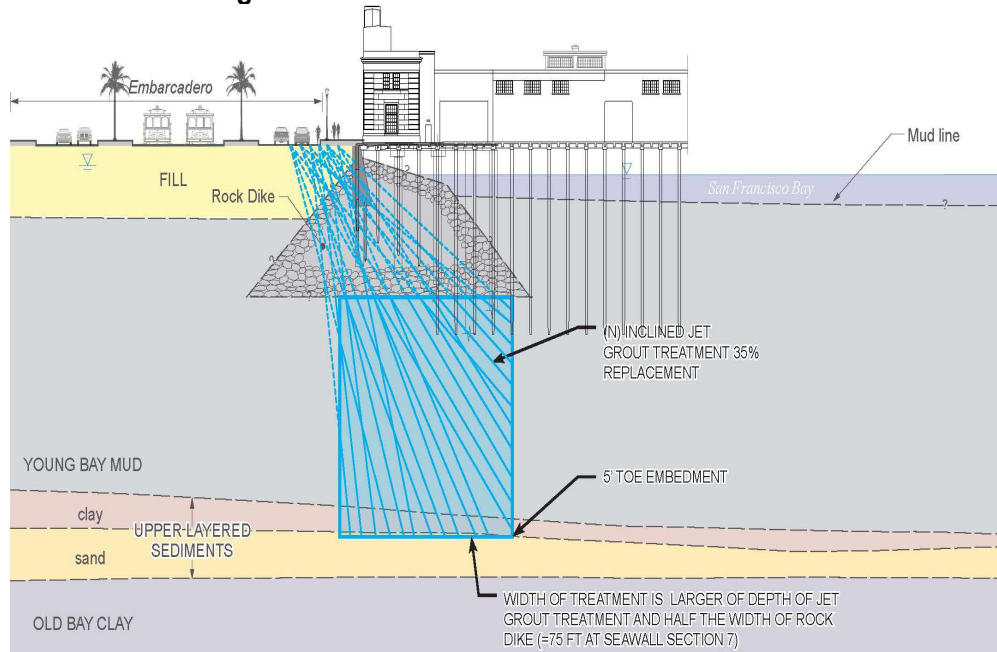
1. Initially, the Port team was focused on the 3-mile Embarcadero Seawall area; direction from Director Forbes and the Port Commission extended the effort across the Port's entire 7-½ mile jurisdiction, in part to reflect the scope of the USACE Flood Study.
2. In 2018, the Port team was uncertain about the timing of the need to adapt to sea level rise. At the time, there was a thought that the work we would design and implement through the Program would focus on creating an earthquake-stable foundation for later sea level rise adaptation, potentially leaving much of today's waterfront with the same form and function. As further described in this report, the Program team concluded that the cost and disruption associated with stabilizing the Embarcadero Seawall and the timing of future flood risk suggests the need to both stabilize the seawall and elevate the shoreline at the same time.

² For a copy of this Staff Report, please see:

<https://sfport.com/meetings/san-francisco-port-commission-august-8-2017>

- Based on the 2016 Earthquake Vulnerability Study of the Northern Waterfront Seawall, the Port team thought that there were potential options for Seawall stabilization that could be implemented with moderate disruption, as shown in the figures below. Further analysis and contractor interviews led to the conclusion that these less disruptive options were either not viable or would not achieve desired earthquake performance objectives.

Figure 1: Jet Grout Under Rock Dike – Inclined



- The Port team’s pre-Proposition A approach envisioned 1-2 distinct Seawall segments that could be improved through a 10-year, \$500 million first phase of a larger program, and that this first phase would be identified through a 2.5-year effort which would include a multi-hazard risk assessment followed by a focused planning effort. Risk assessment and planning ultimately took 5 years before the pre-design of the first 6 of 23 Embarcadero Early Projects started, as more fully described under Section 6 PMPEC Deliverables and Contract Expenditures below.

This report documents the major PMPEC Contract deliverables and the work with USACE that informed our new understanding of the scope and scale of the Waterfront Resilience Program. As reported by Executive Director Forbes at the November 14, 2023, Port Commission meeting, the Port, its partner agencies, and USACE have agreed to the January 2024 public release of a Draft Integrated Feasibility Report and Environmental Impact Statement which includes a Tentatively Selected Plan (Draft Plan) to reduce flood risk along the Port’s 7½ mile jurisdiction. Under USACE regulations, we are not permitted to publicly share the details of that Draft Plan until its formal release. Port staff plans a February 2023 presentation to the Port Commission on the Draft Plan with representatives from USACE.

The Waterfront Resilience Program team (Program team) has made important strides since 2018, but progress has not been linear. USACE planning manuals emphasize the

need to *iterate* plans multiple times to find the optimal solution to what they refer to as *wicked problems*.

“Planning problems are usually ill-structured or wicked problems, situations where cause and effect, assumptions, structure, and objectives are unclear. Data may be sparse or missing. These kinds of problems must be explored and understood before they can be solved.³”

One challenge for the team has been the uncertainty associated with sea level rise. Current science cannot predict the rate of sea level rise to expect, but instead yields a range of sea level rise scenarios. As shown in Figure 3 below, USACE has three such scenarios; the State of California has published different predictions. The Program team advocated choosing a single sea level rise scenario to guide plan formulation, but the 2021 USACE guidance for the Flood Study required formulation and comparison of plans across a range of sea level rise scenarios.

To inform our planning, we have looked at a range of elevations (to address different sea level rise projections) and how these elevations affect a range of infrastructure systems (Port piers, wharves and seawall, SFMTA light rail, Public Works streets).

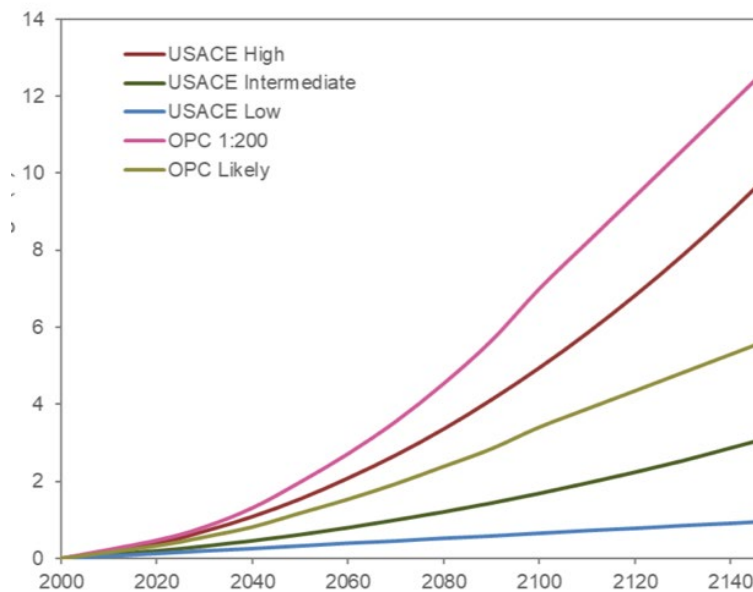


Figure 3: USACE and State of California Sea Level Rise Scenarios⁴

Based on the Program team’s current understanding and recommendations, the Waterfront Resilience Program is a multi-billion dollar program that will:

³ Planning Manual Part II: Risk Informed Planning, USACE Institute of Water Resources, Charles Yoe, Notre Dame of Maryland University, with assistance from Brian Harper, Galveston District, 2017, page 55 https://planning.erdc.dren.mil/toolbox/library/Guidance/PlanningManualPartII_IWR2017R03.pdf

⁴ Figure 4 displays both the California Ocean Protection Council and USACE sea level rise projections baselined to the year 2000 for the purposes of illustration.

- Cost between \$10-20 billion, with a 65% federal contribution subject to USACE recommendation and Congressional appropriation approval, requiring multiple local and state sources to provide 35% of project costs;
- Take several decades to implement under a phasing plan the City will need to develop in conjunction with USACE; and
- Require re-examination of the 23 Embarcadero Early Projects that the Waterfront Resilience Program team identified and presented to the Port Commission on December 14, 2021⁵.
 - Depending on the final timeline agreed upon by the City for implementation of the USACE Draft Plan, staff expects that some of these Embarcadero Early Projects may not be required if relatively near-term federal investment replaces the structures these projects propose to seismically retrofit.
 - Other Embarcadero Early Projects will be implemented using Proposition A bond funding and will provide safety benefits now and give the Program team a better understanding of how to implement the larger program of improvements recommended by USACE. Some of these projects could also be part of the USACE Draft Plan for which the Port could receive important local credit required to match federal investment.
 - Staff expects to have a much clearer picture of the relationship between all 23 Embarcadero Early Projects and the USACE Draft Plan, including the implementation plan for the USACE effort, by the second half of 2024.

In a separate item on today's agenda, we are describing a path to generate further design information on certain Early Projects that we believe will provide safety benefits in the near term; this information will assist in determining the utility of proceeding with those projects in the meantime ahead of the USACE effort.

In the remainder of this report, we highlight tasks executed under the PMPEC Contract that have shaped our evolving understanding of how to plan and implement projects to reduce earthquake and flood risk along the waterfront.

PMPEC CONTRACT – ORIGINAL RFP, SCOPE AND FUNDING SOURCES

As August 8, 2017 staff report⁶ to the Port Commission and as shown in Exhibit A, the original scope for the PMPEC Contract assumed a 10-year \$500 million program of improvements, executed through four contract phases:

⁵ For a copy of the staff report, please see: <https://sfport.com/meetings/san-francisco-port-commission-december-14-2021>

⁶ For a copy of the staff report, please see: <https://sfport.com/meetings/san-francisco-port-commission-august-8-2017>

Phase 0: Program Management and Controls (10 years, spanning Phases 1-3), including a consultant team project manager, technical team leaders for multiple disciplines, monthly and quarterly reports, meeting scheduling and minutes, a risk register, and assistance developing and managing the project management plan.

Phase 1: Planning (2 years), including:

- Conduct a Feasibility Study, including problems and opportunities, existing conditions, formulation, evaluation, and comparison of project alternatives, and identification of a recommended program of initial improvements to address seismic and flood risk.
- Prepare Supporting Studies and Scopes of Repair, including condition assessment of the bulkhead wall and wharves, the Embarcadero roadway, light rail and utilities, earthquake and flood vulnerability assessment, environmental and economic analysis, community planning and stakeholder engagement, cost estimating, and a project-area specific multi-hazard loss analysis.

Phase 2: Preliminary Design & Entitlements (2 years), including 35% design, analysis under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), constructability review, value engineering, design and construction delivery options and recommendations, pilot studies, permitting, and stakeholder engagement.

Phase 3: Final Design and Construction (5 years), including support to the Port and other consultants and contractors who would complete final design, permitting, construction, and mitigation and monitoring plans and oversight of construction management.

Table 2: Original PMPEC Contract Phases & Budget

Phase	Budget
Phase I - Risk Assessment and Planning	\$ 10,239,424
Phase II - Design/Entitlements	\$ 18,505,154
Phase III - Construction Support	\$ 7,605,162
Subtotal - All Phases	\$ 36,349,740
10% Contingency	\$ 3,634,974
Total Contract Authorization Request	\$ 39,984,714

The August 8, 2017 staff report indicated that PMPEC Contract services would be partially funded by the CPO-756 Seawall and Marginal Wharf Repair Project in the amount of \$6,300,000, funded by contributions from several City departments including the Port, and other project sources that the Port was then pursuing, including the potential 2018 Seawall General Obligation Bond. This expectation was borne out during the PMPEC contract period; see PMPEC Deliverables and Contract Expenditures below for details regarding funding for the contract.

2019 AMENDMENT TO PMPEC CONTRACT & SCOPE

As described above, on June 7, 2018, USACE awarded San Francisco a “new start” study appropriation to commence a General Investigation (GI) feasibility study to examine coastal flood risk consider and recommend potential project alternatives that would reduce that risk along the San Francisco waterfront (the Flood Study). Following the completion of the GI feasibility report, if USACE recommends and Congress approves a project for implementation, the federal government will pay for 65% of the cost of design and construction, and the City and/or State will pay for 35% of the cost of design and construction, and the costs of any “betterments” that the City desires but USACE finds are not in the federal interest.

Consistent with USACE national practice, the original Flood Study scope assumed a 3-year, \$3 million effort. On August 14, 2018, the Port Commission authorized the Executive Director to enter into a Feasibility Cost Sharing Agreement (FCSA) with USACE to jointly pursue the Flood Study⁷. The Port and USACE executed the FCSA on September 5, 2018.

With the inherent complexity of the San Francisco waterfront, the combination of flood and earthquake risk, and multiple infrastructure systems along the shoreline, the Port and USACE team realized that the scope of the Flood Study would require more time and funding than 3 years and \$3 million.

To accomplish this, the following steps were required:

- The USACE and Port teams rescoped the Flood Study in early 2019 to support an exemption request by the USACE team to USACE headquarters for more federal funding and time to complete the Flood Study;
- The Port team developed a revised scope of services and requested Port Commission authorization to amend the PMPEC Contract to support the larger planning effort jointly scoped by USACE and Port staff; and
- USACE headquarters needed to approve the exemption request, resulting in the need to amend the FCSA governing the Flood Study partnership between USACE and the Port, as further described below.

On September 24, 2019, the Port Commission authorized an amendment to increase the contract by \$19,992,357 to an amendment not to exceed the contract amount of \$59,977,071⁸. Staff requested the additional funding to support higher than previously expected contract support needed for the following services:

⁷ For a copy of the staff report, please see:
<https://sfport.com/meetings/san-francisco-port-commission-august-14-2018>

⁸ For a copy of the staff report, please see:
<https://sfport.com/meetings/san-francisco-port-commission-september-24-2019>

- **United States Army Corps of Engineers Flood Study In-Kind Services**, including civil design, urban design, economics, public outreach, NEPA compliance, and plan formulation.
- **Planning**, including mid and long-range planning to develop feasible alternative shoreline configurations that would be resilient to sea levels expected in 2120 and beyond.
- **Multi-Hazard Risk Assessment**, including additional scope to characterize earthquake and flood risks associated with the Seawall and measure the economic, societal, and environmental consequences of those risks.
- **Advanced Earthquake Analysis, Ferry Building Area** including advanced seismic analysis to better understand the behavior of design alternatives to the structures, the BART tunnel, the ferry plaza, and the Embarcadero.
- **Stakeholder Engagement**, including outreach to constituents in three geographic areas along the Port of San Francisco jurisdiction — the Embarcadero, Mission Creek, and Islais Creek areas.
- **Local Business Enterprise (LBE) Support Services** to identify goals and create and implement a plan to encourage greater LBE participation, including from minority and women-owned firms, in projects to improve the Seawall.
- **Workforce Development Services** to develop a strategy to educate, train, and place San Francisco economically-disadvantaged residents in construction careers.
- **Public Education** to engage the community regarding elements of the Port's resilience efforts.
- **Disaster Response Planning** to evaluate 1) the areas of the northern and southern waterfront that are most important to the City's response function, and 2) how the City should amend existing Port, City, and regional plans to respond to the types of potential Port damage that the Multi-Hazard Risk Assessment is expected to show.
- **Project Management** for project management to support and administer a longer-term USACE Flood Study and planning effort than previously anticipated and to manage the additional effort described above.

Exhibit B includes a table comparing the budgets for the 2017 PMPEC Contract versus the 2019 Amendment.

On May 26, 2020, the Port Commission authorized staff to enter amendments to the USACE FCSA reflecting the aforementioned joint rescoping of the Flood Study, extending the period to perform the Flood Study and increasing the budget, including the Port's 50%

match⁹. 18 months later, USACE approved an exemption request in late 2021 to increase the time allotted to and funding for the Flood Study to 7 years, 2 months, and \$16 million. See *Adaptation Strategies and USACE Flood Study* below for changes encountered during the Flood Study.

CONTRACT CONTROLS

The PMPEC Contract is a task order-based contract, with a general scope of services as reflected in Exhibit A. The contract is structured so that when the Waterfront Resilience Program requires a scope of services under the contract, the Port and the PMPEC team go through a process to develop a more detailed scope of services and budget. This operates in a manner similar to the Port's as-needed engineering, environmental, and real estate contracts.

The Port team has implemented a structured approach to task order delivery to ensure the Port retains close oversight of the scope of work. All tasks are initially requested by the Port, detailing the expected scope and outcomes that are to be achieved. As the CH2M team develops the scope and selects the team members or subcontractors assigned to the task, the Port Task Lead works with them to ensure the scope, schedule, and budget meet the requirements of the Port.

A formal proposal is then submitted to the Port and reviewed by the Port Contracts Manager, Chief Financial Officer, and Task Lead before being updated and adjusted if required and then accepted. Acceptance requires signature approval by the Program Administrator, Task Lead, and Waterfront Resilience Director. All task deliverables are reviewed and approved by the Task Lead and the Waterfront Resilience Director.

The invoice approval process also ensures a review of contract compliance and required supporting documentation of expenditures. Once an invoice is submitted by CH2M, the Program Administrator reviews the submittal for compliance and required subcontractor invoices and reimbursable receipts. Port Task Leads review the invoice and monthly report to confirm and approve that the submitted expenditures and deliverables have been completed. After the Program Administrator and Task Leads approve the invoice, the Program Director has the final review and approval before Port Accounting can process the payment.

PMPEC DELIVERABLES AND CONTRACT EXPENDITURES

This section of this report is structured as follows:

- **Projected Fee vs. Authorized Fee** 1) examines the main tasks in the Program where costs varied from 2019 projections and 2) describes work anticipated under the contract that did not occur because resources were directed to other efforts below; and

⁹ For a copy of the staff report, please see: <https://sfport.com/meetings/san-francisco-port-commission-may-26-2020>

- **Deliverables** describes the work that was conducted and what the Program team produced and learned as the Program advanced, including:
 - Existing conditions analysis and risk assessment,
 - Developing measures to address risk,
 - Embarcadero Early Project identification and design,
 - Adaptation planning for sea level rise and collaboration with USACE, and
 - Related major tasks including program management, program funding, communications and stakeholder engagement, equity, workforce development, and local business enterprise engagement.

Projected Fee vs. Authorized Fee:

The PMPEC Contract as amended in 2019 was assumed to be a 10-year (2017-2027) contract that would continue through the construction period and completion of the USACE Flood Study.

The contract is now expected to be fully utilized by June 2024, 7 years after contract initiation, and will carry the program through alternative development on 7 Embarcadero Early Projects and through the Agency Decision Milestone in the USACE Flood Study in June of 2024.

The primary reasons why the contract capacity was used more quickly than expected relate to the complexity of planning for sea level rise adaptation and planning for multi-hazard improvements with a much higher anticipated range of costs (\$10-20 billion).

Table 3: Comparison of 2019 Projected Contract Budget versus Authorized Fee			
Task #	Task	2019 Amendment Projected Fee	Authorized Fee (October 2023)
Phase 1: Planning			
1.01	Management and Coordination of Services, Phase 1	\$5,041,286	\$8,385,456
1.02	Stakeholder Engagement, Phase 1	\$2,093,732	\$1,277,256
1.03	Existing Conditions Review and Documentation	\$3,937,858	\$3,568,597
1.04	Multi-Hazard Risk Assessment	\$7,471,595	\$6,461,735
1.05	Alternatives Development, Analysis, and Preferred Program	\$6,580,713	\$12,153,614
1.06	City Staff Training, Phase 1	\$35,460	\$35,192
1.07	Seismic Peer Review Panel, Phase 1	\$864,135	\$876,577
1.08	Port Alignment Workshop	\$60,225	\$60,225
1.09	USACE Feasibility Study	\$7,589,800	\$7,521,152
1.10	Workforce Development and LBE Support Services	\$1,228,500	\$870,439
Phase 2: Preliminary Design & Engineering, Initial Projects (1)			
2.01	Management and Coordination of Services, Phase 2 (1)	\$3,429,455	\$5,355,594
2.02	Community Planning and Stakeholder Engagement	\$845,387	\$2,451,529
2.03	Initial Projects, Preliminary Design	\$3,020,758	\$9,442,576
2.04	Pilot Projects	\$604,939	\$506,779
2.06	Environmental Review and Permitting	\$5,186,989	\$202,012

Task #	Task	2019 Amendment Projected Fee	Authorized Fee (October 2023)
2.07	City Staff Training, Phase 2	\$53,190	\$0
2.08	Engineering Peer Review Panel - Phase 2	\$34,944	\$220,246
Phase 3: Final Design & Construction, Initial Projects			
3.01	Management and Coordination of Services, Phase 3	\$7,072,754	\$0
3.02	Stakeholder Management, Phase 3	\$161,440	\$0
3.03	Value Engineering	\$215,049	\$0
3.04	Independent Design Review	\$155,920	\$0
	Contingency	\$4,292,942	
	Contract Total (2)	\$59,977,071	\$59,388,978
	Remaining to Be Authorized		\$588,093

(1) Management and Coordination of Services authorized under Task 2.02 was focused on Alternatives Development, the USACE Flood Study, Community Planning and Stakeholder Engagement and Preliminary Design and Engineering.

Table 3a below shows the primary tasks that varied from the 2019 budget expectations and the primary reasons more or less funding was expended on these tasks.

Task #	Task	2019 Amendment Projected Fee	Authorized Fee (October 2023)	Analysis (where expenditures varied significantly from projections)
1.01 2.01 3.01	Management and Coordination of Services, Phases 1-3	\$15,543,495	\$13,741,050	Management and coordination of services is primarily, but not exclusively, billed to the prime contractor and is typically a % of overall program services (approximately 25% in this case). While the ultimate authorized fee was lower than projected in 2019, funds spent on these services for phases 1 & 2 were 36% higher than projected for these phases in 2019. This was due to higher than expected program spending on planning for a larger than anticipated program and related activities.
1.02 2.02 3.02	Stakeholder Engagement, Phases 1-3	\$3,100,559	\$3,568,597	Expenditures under these tasks were approximately 15% higher than anticipated, largely due to the longer than anticipated planning period and the need to regularly engage with the public regarding Program advances.
1.03 1.04	Existing Conditions Review and Documentation & Embarcadero Seawall Multi-Hazard Risk Assessment	\$11,409,453	\$10,030,332	Ferry Building analysis and existing conditions documentation, originally envisioned as part of this task, was shifted to task 2.03.

Table 3a: Analysis of Tasks that Varied from 2019 Projected Fees

Task #	Task	2019 Amendment Projected Fee	Authorized Fee (October 2023)	Analysis (where expenditures varied significantly from projections)
1.05	Alternatives Development, Analysis, and Preferred Program	\$6,580,713	\$12,153,614	<p>This work exceeded 2019 projections by 85%. This is the principal driver of the faster than expected utilization of the PMPEC Contract. This work exceeded 2019 budget projections because:</p> <ul style="list-style-type: none"> • In 2019, the Program team did not anticipate that the scale of required actions to address sea level rise and shoreline stability would ultimately cost \$10-20 billion; • In approving an exemption request for the SF Flood Study, USACE required development of new flood risk mitigation alternatives scaled to different rates of sea level rise. Much of this adaptation planning was conducted by the Port/PMPEC team.
				<ul style="list-style-type: none"> • The need to compare 7 waterfront adaptation strategies across 3 USACE sea level rise projections also increased costs. <p>See <i>Adaptation Strategies and USACE Flood Study</i> under Deliverables below for a more complete discussion of these factors.</p>
1.06	City Staff Training, Phase 1	\$35,460	\$35,192	
1.07	Seismic Peer Review Panel, Phase 1	\$864,135	\$876,577	
1.08	Port Alignment Workshop	\$60,225	\$60,225	
1.09	USACE Feasibility Study	\$7,589,800	\$7,521,152	
1.10	Workforce Development and LBE Support Services	\$1,228,500	\$870,439	<p>To advance from workforce and LBE planning to implementation of these efforts, these work streams are dependent on the selection of final alternatives with specific project conceptual designs and associated work types and trades/specialties. Finalization of the conceptual design will occur as the PMPEC contract closes out, so this implementation work will need to continue under a new contract.</p>

Table 3a: Analysis of Tasks that Varied from 2019 Projected Fees				
Task #	Task	2019 Amendment Projected Fee	Authorized Fee (October 2023)	Analysis (where expenditures varied significantly from projections)
Phase 2: Preliminary Design & Engineering, Initial Projects (1)				
2.03	Initial Projects, Preliminary Design	\$3,020,758	\$9,442,576	The 2019 contract amendment budget was based on 3 undefined projects with a \$650 million construction budget. The actual work included advancing the pre-design of 7 projects with a total value estimated at up to \$2 billion including additional geotechnical exploration and complex analysis work at the Ferry Building. Authorized expenditures are reasonable for the 7 Embarcadero Early Projects and in line with industry standards for projects of this scale and complexity.
2.04	Pilot Projects	\$604,939	\$506,779	These expenditures reflect work on the Living Seawall Pilot which requires an additional 1-2 years of monitoring. Continuation of monitoring will require a new contract vehicle.
2.06	Environmental Review and Permitting	\$5,186,989	\$202,012	Environmental review on Embarcadero Early Projects will occur after these projects achieve a 10% level of conceptual design and will need to be performed under a new contract.
2.07	City Staff Training, Phase 2	\$53,190	\$0	Will need to be conducted under a new contract.
2.08	Engineering Peer Review Panel - Phase 2	\$34,944	\$220,246	EPRP involvement was increased due to the number and complexity of projects in pre-design including the Ferry Building where complex soil/structure analysis was advanced.
Phase 3: Final Design & Construction, Initial Projects				
3.03	Value Engineering	\$215,049	\$0	Will need to be conducted under a new contract.
3.04	Independent Design Review	\$155,920	\$0	Will need to be conducted under a new contract.
	Contingency	\$4,292,942		
	Contract Total (2)	\$59,977,071	\$59,388,978	
	Remaining to Be Authorized		\$588,093	

Deliverables:

The Waterfront Resilience Program team has utilized the PMPEC contract as our primary contracting vehicle for virtually all Program-related activities since 2017, with the major exception of a communications contract with Civic Edge Consulting which ended in August 2021. Activities included program management services, risk analysis, identification and

preliminary design of Embarcadero Early Projects, resilience planning waterfront-wide, communications and stakeholder engagement, equity planning, workforce development, and local business enterprise services.

Exhibit B includes a history of the work we performed with the PMPEC team, including major lessons that informed the development of the Program.

A full list of PMPEC Contract Tasks and Deliverables under the PMPEC Contract is included in Exhibit C.

RDJ ENTERPRISES, LLC

CH2M included RDJ Enterprises, LLC (RDJ Enterprises) on the PMPEC Contract as part of their initial response to the Port’s bid opportunity. As prime, CH2M also selects the subcontractors most qualified to perform work under tasks requested by the Port.

Over the course of the contract, RDJ Enterprises played a significant role in several work streams on the Program including stakeholder engagement, focused on the southeast neighborhoods, equity, and workforce development. CH2M invoiced the Port \$821,387 for work performed by RDJ Enterprises on a time and materials basis for the work performed under these Communications and Stakeholder Engagement tasks.

On August 30, 2023, Dwayne Jones, principal and CEO of RDJ Enterprises, was charged by the San Francisco District Attorney with misappropriation of public money, bribery, and aiding and abetting a financial conflict of interest in a government contract.

The Port team takes its responsibility as steward of public resources very seriously. The Port immediately directed CH2M Hill to cease all work with RDJ Enterprises, and a stop work order was issued on August 31, 2023.

PMPEC CONTRACT REMAINING CAPACITY AND ACTIVE AUTHORIZED TASKS

Table 5: PMPEC Remaining Contract Capacity	
Task	Remaining Balance (through 10/23)
1.05 Alternatives Development, Analysis, and Preferred Program	\$972,052
1.06 City Staff Training, Phase 1	\$2,772
1.09 USACE Feasibility Study	\$807,212
1.10 Workforce Development and LBE Support Services	\$53,828
2.01 Management and Coordination of Services, Phase 2	\$815,240
2.02 Community Planning and Stakeholder Engagement	\$399,184
2.03 Initial Projects, Preliminary Design	\$3,496,794
2.04 Pilot Projects	\$173,900
2.06 Environmental Review and Permitting	\$183,698
2.08 Engineering Peer Review Panel, Phase 2	\$68,298
Contract Balance (not yet authorized)	\$588,093
Total Balance	\$7,561,071

Based on projected spending, contract capacity is expected to be exhausted by June 2024.

CONCLUSION

As described in this report, the scope of the Waterfront Resilience Program changed over the past 6 years from a \$500 million first phase focused on the Embarcadero Seawall to a multi-billion waterfront-wide effort. The task-based nature of the PMPEC contract, coupled with the broad experience in the consultant team, enabled the Port to manage this transition and complete the following key efforts:

- The Embarcadero Seawall Multi-Hazard Risk Assessment;
- Seismic Measures Development;
- Identification of 23 Embarcadero Early Projects, 7 of which are advancing through predesign;
- Robust community engagement for 6 years across the waterfront and Citywide;
- Development of sea level rise adaptation strategies and a draft plan for waterfront adaptation in close coordination with the Port's sister agencies;
- Development of workforce development and local business enterprise engagement strategies;
- Development of an equity work plan; and
- Partnering with USACE through work-in-kind to support the USACE Flood Study, including identification of the Draft Plan which will be described in the Draft Integrated Feasibility Report and Environmental Impact Statement due to be released to the public in late January 2024.

We are in the early stages of Program development and much work remains, including:

- Public engagement regarding the USACE Draft Plan (February-March 2024) and subsequent plan changes (2024/25);
- Development of a Final Plan and Feasibility Report with USACE through the Flood Study (end of 2025);
- Identification of the final projects to be funded by Proposition A (late 2024);
- Start of construction for at least 1 Embarcadero Early Project (late 2024);
- Development of a strategy for assembling the local and state matching funds to match future federal funding for sea level rise adaptation (2024-30); and
- Design and public engagement for 1 or more segments of the Draft Plan (2024-2030).

The professionals working on the PMPEC Contract and the contract itself have enabled the Port team to launch the Waterfront Resilience Program from the concept stage to a Program that has assessed critical waterfront risks, is advancing capital projects through design, has developed a Draft Plan for waterfront adaptation, and has identified credible sources of state and federal funding to advance this work over the coming decades.

Since the contract as previously amended has reached capacity, and the Waterfront Resilience Program requires continued program management support, staff recommends

a new competitive solicitation for program management services and will return to the Port Commission in the first quarter of 2024 to request authorization to advertise for these services.

Prepared by: Carlos Colon
Waterfront Resilience Program Administrator

Brad Benson
Waterfront Resilience Director

Exhibits: A: PMPEC Contract Original Scope
B: Budget Comparison, 2017 PMPEC Contract versus 2019 Amendment
C: Description of Major Deliverables and Lessons Learned
D: PMPEC Contract Tasks and Deliverables
E: Embarcadero Seawall Multi-Hazard Risk Assessment Key Take-Aways
F: Seismic Measures Development Key Findings
G: Communications and Stakeholder Engagement

EXHIBIT A PMPEC CONTRACT ORIGINAL SCOPE

The proposed scope for the proposed contract includes the specialized and expert services needed to complete planning studies, develop and assess alternatives, select and define a preferred alternative, advance engineering and design to 35 percent, complete California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) approvals, advance environmental and other permitting for construction, develop and recommend final design and construction project(s) delivery methods, and to assist with managing and review of final design and construction of the project(s). Final design, construction, and construction management will be handled via separate contracts.

The proposed contract will require the consultant to provide the following services:

Phase 0: Program Management and Controls (10 years)

The consultant will support the Port's Project Management team by providing the following services and personnel:

- Consultant team project manager, single point of contact.
- Technical team leaders for structural engineering, coastal engineering, geotechnical engineering, civil engineering, utility engineering, transportation engineering, urban planning and design, historic preservation, environmental planning, and permitting
- Quarterly project reports
- Monthly project updates
- Meeting scheduling and minutes
- Develop and maintain a risk register
- Assist the Port in refining and actively managing the project management plan

Phase 1: Planning (2 years)

The consultant will lead and carry out all work necessary to complete a multi-hazard feasibility study of the Seawall that culminates in a framework to address the dual threats of seismic and flood risk and a recommendation for initial project improvements to be implemented. This will include conceptual designs, cost estimates, construction impacts and schedules, environmental impacts and benefits, and economic impacts and benefits.

- Conduct a Feasibility Study
 - Identify problems and opportunities.
 - Inventory and forecast conditions.
 - Formulate project alternatives.
 - Evaluate project alternatives.
 - Compare project alternatives.
 - Select a recommended program for initial improvements and a framework for responding to the dual threat of seismic and flood risk.
- Prepare Supporting Studies and Scopes of Repair
 - Condition assessment of bulkhead wall and wharves, Embarcadero promenade and roadway, light rail, and utilities.
 - Advance existing screening level earthquake vulnerability assessment including developing and implementing a subsurface exploration program.
 - Advance existing flood assessment including developing coastal modeling, transects for wave run-up and effects, and consideration of sea level rise and other climate change impacts such as storm intensity.
 - Assess existing environmental conditions and potential impacts and benefits with various improvement concepts.
 - Constructability analysis and impact assessment of various improvement concepts.

- Economic analysis with direct and indirect considerations of various improvement concepts.
- Develop and support the Port to complete a community planning and stakeholder engagement process to inform improvement concepts that include public workshops, and engage Port tenants, and key stakeholders.
- Cost estimating
- Implement a project area-specific multi-hazard loss estimation analysis with customized inputs for piers, wharves, bulkhead buildings, shed buildings, seawalls, and geotechnical conditions.

Phase 2: Preliminary Design & Entitlements (2 years)

During this phase, the consultant will advance the design of initial improvements to the 35 percent level and complete both CEQA and NEPA processes. This contract scope will require the consultant to perform analyses for CEQA and NEPA regarding specific improvement projects that emerge from the proposed contract work. Specific scope tasks will include:

- CEQA, programmatic and initial improvements.
- NEPA, programmatic and initial improvements.
- Advance design and engineering of initial improvements to 35 percent level, including plans, specifications, estimates, and supporting design and engineering documents.
- Constructability review and analysis.
- Value engineering.
- Design and construction delivery options and recommendations.
- Develop an approach to permitting pilot studies and initial improvements, develop alternatives analysis, environmental mitigation, and enhancement concepts, generate information needed for construction permits; apply for permits and approvals from the San Francisco Bay Conservation and Development Commission (BCDC), State Water Resources Control Board, USACE and resource protection agencies. Finalizing environmental permits for construction is expected to continue through final design.
- Continuation of stakeholder engagement.

Phase 3: Final Design and Construction (5 years)

During this phase, the consultant will support the Port as other consultants and contractors complete the final design, permitting, construction, and mitigation and monitoring plans. Others will also provide construction management services.

- Review final designs and engineering studies, reports, plans, specifications, calculations, cost estimates, and construction schedules completed by the other consultant teams.
- Develop and complete a value engineering process for each project.
- Provide a constructability review for each project.
- Design, engineer, and implement pilot projects (small-scale projects that may be necessary to understand the design and viability of specific construction techniques).
- Assist in oversight of construction management.

EXHIBIT B
BUDGET COMPARISON, 2017 PMPEC CONTRACT VERSUS 2019 AMENDMENT

PHASE I: PLANNING		Original Contract	Amended Contract
1.01.00	Management and Coordination of Services, Phase 1	\$2,307,635	\$5,041,286
1.02.00	Community Planning and Stakeholder Engagement, Phase 1	\$548,308	\$2,093,732
1.03.00	Data Collection, Review, and Existing Conditions	\$744,896	\$3,937,858
1.04.00	Multi-Hazard Risk Assessment	\$3,957,708	\$7,471,595
1.05.00	Alternatives Formulation, Analysis and Program Development	\$2,381,399	\$6,580,713
1.06.00	City Staff Training, Phase 1	\$35,460	\$35,460
1.07.00	Seismic Peer Review Panel, Phase 1	\$264,017	\$864,135
1.08.00	Alignment Workshop	\$0	\$60,225
1.09.00	USACE - General Investigation	\$0	\$7,589,800
1.10.00	LBE Support and Workforce Development	\$0	\$1,228,500
	TOTAL PHASE I	\$10,239,424	\$34,903,305

PHASE II: PRELIMINARY DESIGN & ENGINEERING, INITIAL PROJECTS			
2.01.00	Management and Coordination of Services, Phase 2	\$3,429,455	\$3,429,455
2.02.00	Stakeholder Engagement, Phase 2	\$700,414	\$845,387
2.03.00	Initial Projects, Preliminary Design	\$4,098,308	\$3,020,758
2.04.00	Pilot Projects	\$604,939	\$604,939
2.05.00	Emergency Projects	\$4,396,914	\$0
2.06.00	Environmental Review and Permitting	\$5,186,989	\$5,186,989
2.07.00	City Staff Training, Phase 2	\$53,190	\$53,190
2.08.00	Seismic Peer Review Panel, Phase 2	\$34,944	\$34,944
	TOTAL PHASE II	\$18,505,154	\$13,175,663

PHASE III: FINAL DESIGN & CONSTRUCTION, INITIAL PROJECTS			
3.01.00	Management and Coordination of Services, Phase 3	\$7,072,754	\$7,072,754
3.02.00	Stakeholder Management, Phase 3	\$161,440	\$161,440
3.03.00	Value Engineering	\$215,049	\$215,049
3.04.00	Independent Design Review	\$155,920	\$155,920
	TOTAL PHASE III	\$7,605,162	\$7,605,162

TOTAL ALL PHASES	\$36,349,740	\$55,684,130
CONTINGENCY	\$4,292,941	\$59,977,071

EXHIBIT C DESCRIPTION OF MAJOR DELIVERABLES AND LESSONS LEARNED

Existing Conditions Analysis and Multi-Hazard Risk Assessment (Tasks 1.03 and 1.04)

Excluding the associated pro-rata share of contract phase 1 program management services and stakeholder engagement services, the Port expended approximately \$10 million to complete the Embarcadero Seawall Multi-Hazard Risk Assessment (MHRA), or approximately 12% less than budgeted in 2019.

As described in the MHRA staff report¹⁰ to the Port Commission and shown in Figure 4 below, this work was foundational for the Waterfront Resilience Program, providing the Program team with the basic information about existing conditions, soil and structure characteristics, earthquake and flood risks and analytical tools to begin developing and evaluating the program of improvements to address these risks. Key take-aways from the MHRA are included in Exhibit E. The MHRA Historic Assets and Risks Report won the 2022 California Preservation Foundation Preservation Design Award for Cultural Resource Studies & Reports.

The work conducted on the MHRA has played a significant role in shaping how both the Port and USACE recommend approaching future shoreline improvements.

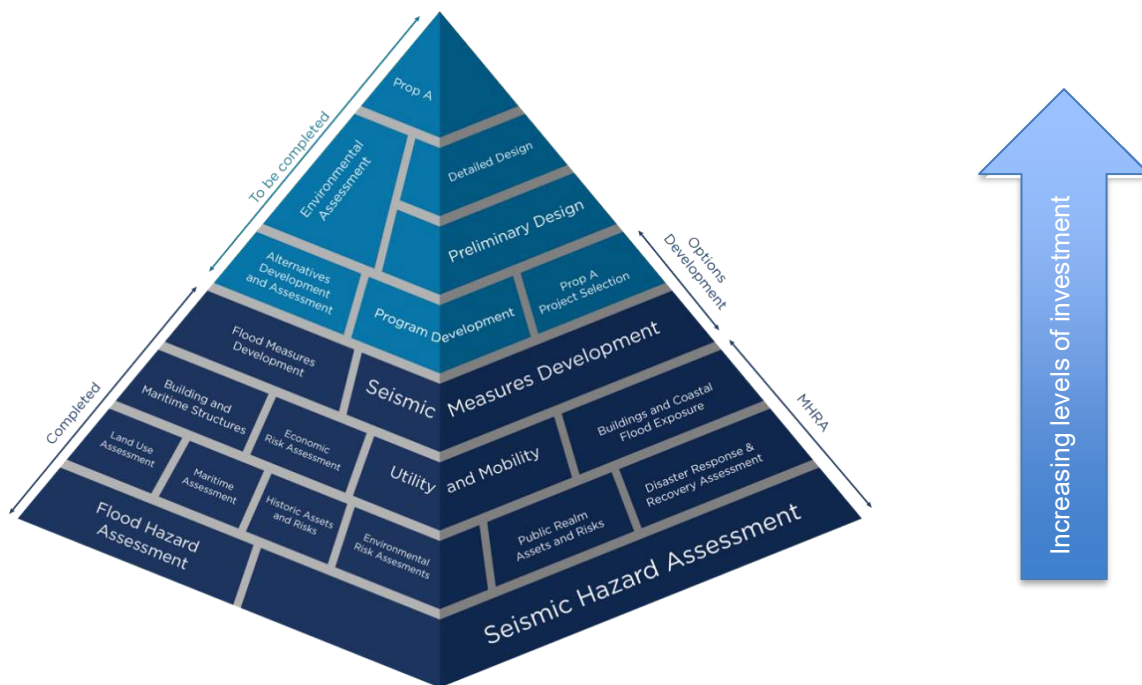


Figure 4: Role of MHRA in Waterfront Resilience Program Development

Seismic Measures Development (Task 1.05.01)

With risk data in hand, the engineering team undertook a focused examination of the cost, feasibility, and performance of earthquake risk reduction measures in the highest risk area of the waterfront from Pier 1 to Pier 43½.

¹⁰ For a copy of the staff report and Embarcadero Seawall MHRA Summary Report, please see: <https://sfport.com/meetings/san-francisco-port-commission-september-22-2020>

The purpose of the seismic measures development (SMD) task was to estimate the efficacy, feasibility, and cost of select measures to reduce seismic risks identified in the MHRA. More specifically, the measures evaluated are to improve the seismic stability of the seawall and shoreline through retrofit or replacement, to reduce the risk of liquefaction of the fill, and to improve the seismic performance of the bulkhead wharf marine structures connected to the seawall.

Exhibit F contains the key findings of this task. Notable findings included a finding that lighter touch improvements such as compaction grouting and polymer injection would be insufficient on their own to reduce lateral spreading and stabilize the shoreline.

Measures that were found to be effective in reducing shoreline failure included drilled shafts, a near-shore buttress, a landside buttress, and (north of Pier 17) super-bulkhead wharves, but these measures were found to be so costly and disruptive that they should not be implemented without improvements that would also address sea level rise risk. Simpler, less expensive wharf retrofits and related wharf improvements were found to be effective at reducing earthquake collapse risk and associated life safety risk but were not effective in reducing damages and associated downtime.

A significant conclusion from the SMD task was that improvements this costly and disruptive should be coupled with sea level rise adaptation and that it would be extremely challenging to plan and design improvements of this scale for a section of the Embarcadero without a cohesive plan for treatment of the whole corridor.

Embarcadero Early Projects (Task 2.03)

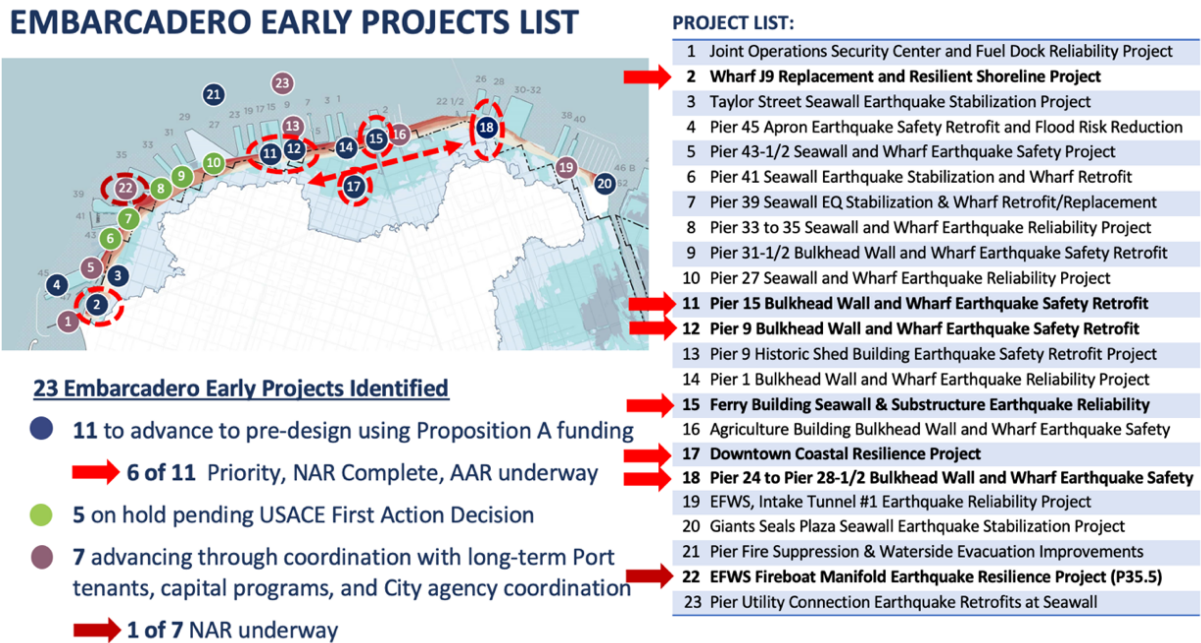
During the remainder of 2021, the Program team identified potential Proposition A projects through a close examination of the risks revealed by the MHRA, the shoreline conditions at each section of the Embarcadero waterfront, and the learning from Seismic Measures Development.

Port staff presented the Program team's recommendations for Embarcadero Early Projects at the December 14, 2021, Port Commission meeting¹¹. The Program team identified and evaluated a total of **23** Embarcadero Early Projects, as shown in Figure 6. The total rough order of magnitude cost range estimated to deliver all projects ranges from **\$650** million to **\$3** billion. Of these, the Program team recommended:

- advancing **5** through the development of an overall geographic strategy for the stretch between Piers 19 and 41,
- advancing **11** projects to pre-design, through steps including a needs assessment report (NAR), alternatives analysis report (AAR), and conceptual engineering report (CER) which results in a scope, schedule, and budget for each project, and
- advancing **7** through coordination with Port tenants, the Port's 5-Year Capital Improvement Program, and City agency coordination.

¹¹ For a copy of the staff report, please see:
<https://sfport.com/meetings/san-francisco-port-commission-december-14-2021>

Figure 5: Map of Embarcadero Early Projects, with Current Status



The Program Team has authorized \$9,442,576 to advance 7 projects through pre-design. Because the PMPEC contract is at capacity, the pre-design work under the PMPEC contract on these projects will stop at alternatives analysis instead of completing conceptual engineering, as originally intended. The original plan was to complete conceptual engineering, establish the baseline scope/schedule/budget, and then, if approved, seek new contracts for detailed design or alternative delivery (e.g., design-build, construction manager-general contractor).

Engineering on 5 of these projects is, however, sufficiently advanced to recommend seeking new design contracts to complete conceptual engineering, detailed design, and design support during construction. The Port Commission will be considering staff's request to procure design services using a solicitation to the as-needed engineering pool of pre-qualified firms¹² at the December 12, 2023, Port Commission meeting. These design contracts will further advance progress in delivering on the Proposition A Seawall Earthquake Safety Bond.

Port leadership will be asked to make final decisions about proceeding with each project with Proposition A funding (or other sources, if appropriate), as follows:

- When projects have a baseline scope, schedule, and budget after conceptual engineering, the Program team will ask Port Executive Director Forbes for authorization to proceed to the final design; and
- At the completion of the final design, staff will request authorization from the Port Commission to bid construction of the projects.

Different Embarcadero Early Projects will reach these milestones at different times, so approvals to advance these projects will occur on a rolling basis.

¹² The Port Commission established the as-needed pool of engineering firms at its December 13, 2022 meeting. For a copy of the staff report, please see: <https://sfport.com/meetings/san-francisco-port-commission-december-13-2022-0>

When the Program hires additional project management staff and has a new Program Management contract in place, the Program team will advance additional Embarcadero Early Projects.

Adaptation Strategies and USACE Flood Study (Tasks 1.05 and 1.09)

The Program team has authorized a total of \$19.7 million in funding to develop adaptation strategies and advance the USACE Study, compared to a projected \$14.2 million for these tasks in 2019, a 39% increase. Work completed to date included:

- Developing the initial focused array of alternatives and the database of public and private assets to support flood modeling with USACE in 2020¹³;
- Identifying the Embarcadero Early Projects and flood risk profiles for the entire Port jurisdiction in 2021;
- Developing the Draft Waterfront Adaptation Strategies in 2022;
- Supporting the Engineering with Nature Working Group to identify nature-based adaptation strategies to incorporate in future flood defenses;
- Extensive engagement with City partner agencies to develop and refine the adaptation strategies to suit the needs of the agency;
- Public engagement to review the Draft Waterfront Adaptation Strategies;
- Development of materials to support engagement with City Directors;
- Review of information on contamination issues to inform the adaptation strategies;
- Historic preservation adaptation approaches, including the Bulkhead Wharf Elevation Study, the Wharf to Pier Transition Study, and Piers Adaptation tasks;
- Conducting flood and economic modeling through the USACE Generation 2 Coastal Risk Model (G2CRM) to support the development of the National Economic Development (NED) and part of the Regional Economic Development (RED) analysis;
- Developing sea level rise exposure analysis for public and private assets and infrastructure to support analysis under the USACE Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE) analysis;
- Management of an Engineering with Nature Working Group, including development, evaluation, and screening of nature-based adaptation measures;
- Engagement with a Resource Agency Working Group and a Historic Preservation Technical Advisory Committee;
- Technical scoping of identified alternatives, including preparation of technical sections, plan view figures, and quantities;

¹³ For a copy of the staff report, please see:

<https://sfport.com/meetings/san-francisco-port-commission-october-27-2020>

- Review of USACE cost estimates;
- Reach by reach comparison of Draft Waterfront Adaptation Strategies under the USACE Low, Medium, and High sea level rise projections and under the 4 USACE accounts (NED, RED, EQ, and OSE);
- Evaluation of costs and benefits of the Draft Strategies to inform the selection of a National Economic Development Plan, Comprehensive Benefits Plan, and Tentatively Selected Plan
- Selection of the Draft Plan for waterfront adaptation in concert with USACE and other City agencies, scheduled for release at the end of January 2024 for public review and comment;
- Environmental impacts analysis under NEPA, including cultural resources, air quality, and transportation sections; and
- Documentation of the USACE planning process, including writing sections of the USACE Draft Integrated Feasibility Report and Environmental Impact Statement.

In 2020, in consultation with representatives from City and regional agencies and resource and regulatory agencies, the USACE-Port Project Delivery Team (PDT) began developing a preliminary focused array of alternatives based on themes, including seismic safety and disaster response; historic and cultural preservation; transportation and mobility; ecological assets and services; community cohesiveness, non-structural (e.g., floodproofing buildings and infrastructure). The PDT deployed a range of structural and ecological measures to populate each of the themes.

Work on the focused array continued through early 2021 when the focus of the PDT shifted to gaining the support needed from USACE leadership for an exemption request to extend the Flood Study through the end of 2025 and to increase the study budget accordingly. As part of granting the waiver, USACE leadership developed new guidance directing the PDT to formulate using all 3 USACE sea level rise projections.

Essentially, this new guidance required that we start the adaptation planning effort over – with the benefit of our prior learning – to develop plans scaled to different rates of sea level rise and to fully recognize the multi-hazard nature of the San Francisco waterfront as part of the formulation process. The PDT developed the 7 Draft Waterfront Adaptation Strategies which were released for public review at the San Francisco Port Commission on October 11, 2022¹⁴.

Program Management Services (Tasks 1.01 and 2.01)

The total projected program management services for all contract phases was projected to cost \$15.5 million. The actual authorized fee for contract phases 1 (planning) and 2 (predesign and engineering) is \$13.9 million, which is 11% lower than projected for the whole contract but 36% higher than projected for program management services for phases 1 and 2.

This increase in expenditures was primarily caused by the increased time required for planning and predesign phases compared to initial expectations. Under early contract assumptions, these contract phases were expected to take 4 years, but are now expected to take a little more than 6 years, slightly more than a 33% increase in time required to execute these phases of work.

Through the Program Management tasks, the team has undertaken the following activities:

¹⁴ For a copy of this staff report, please see:

<https://sfport.com/meetings/san-francisco-port-commission-october-11-2022>

- Leadership and guidance to the PMPEC team, working closely with Port staff to ensure the smooth running of the program with issues discussed and resolved promptly to support efficient delivery of the work.
- Health, safety, and well-being leadership for the team.
- Provide Program Management expertise to support the delivery of the contract and support Port staff in their strategic approach to delivery given the changes to the scale of the Program.
- Quality Control of all program deliverables.
- Management of program resources and 40+ sub-consultants.
- Development and implementation of a programmatic governance structure.
- Contract management including cost, schedule, and risk management, and monthly reporting including a monthly delivery dashboard.
- Data and Document Management and support (including the Project Record)
- Programmatic financial forecasting and assessment to support funding strategy.
- Management of sub-consultant resources including performance, monthly invoicing, and reporting.
- Development of programmatic policies and procedures to ensure consistent delivery of work products.
- A program of activities to continue to review program management and delivery and make ongoing improvements for continuous improvement.
- Focus on increasing LBE participation, achieving greater than 28% LBE participation compared to a commitment of 21%.
- Support programmatic reporting to Program stakeholders.
- Sustainability advice and support.
- Knowledge sharing through papers, presentations, and award submissions locally, nationally, and internationally, including being highly commended for International Excellence at the 2022 Flood and Coast Excellence Awards, United Kingdom.

Communications and Stakeholder Engagement (Tasks 1.02 and, 2.02)

Consistent with the Port's Strategic Plan, the Waterfront Resilience Program's planning efforts center on community and stakeholder engagement. The Program has authorized \$3,728,783 through the PMPEC contract to date to carry out robust engagement efforts over the past 6 years.

In addition to sharing our planning efforts and understanding of sea level rise and seismic risks along the waterfront, public feedback has afforded the Program crucial insight into the City's priorities. Community feedback and stakeholder collaboration have informed Program strategy and advanced work on the MHRA, Embarcadero Early Projects, and the Draft Waterfront Adaptation Strategies and Draft Plan for waterfront adaptation.

The community engagement approach included:

- Community meeting series in three geographies: Embarcadero Seawall, Mission Creek / Mission Bay, and Islais Creek / Bayview;
- Participation in and hosting of community events such as mixers, walking tours, and boat tours throughout the waterfront;
- Online engagement through the Waterfront Resilience Program website (sfport.com/wrp); and
- Engagement events were held and materials were developed in Chinese and Spanish.

Public feedback overwhelmingly pointed to community priorities for life safety, multi-modal transit, access to the waterfront and open space, jobs and the economy, shoreline ecology, housing in neighboring communities, and continued transparency from the Port.

The stakeholder engagement approach included engaging with the Port’s partner agencies (SFDPW, SFPUC, SFMTA, BART) to better understand the potential impacts of intersecting infrastructure and assets along the waterfront and presentations to and discussions with local advisory groups and boards.

The communications and stakeholder engagement tasks were awarded the 2019 Award of Excellence from the American Association of Port Authorities: Award for “overall campaign” for Embarcadero Seawall Program communication and the 2019 Award of Excellence from the City-County Communications & Marketing Association for Innovative Communication: Award for “most innovative” for the Embarcadero Seawall “Makers” partnerships.

Stakeholder engagement has been particularly important in developing the Program’s understanding of how best to approach adapting a complex, inter-agency infrastructure network. As the Program prepares for the public release of the USACE Draft Plan, collaboration with partner agencies will continue to play a key role in refining the City’s vision for a resilient waterfront. Exhibit G includes a detailed summary of Program stakeholder engagement efforts.

LBE Support Services & Workforce Development Services (Task 1.10)

Given the unique nature of the Waterfront Resilience Program and the Flood Study, the Port recognized that creative methods and strategies would need to be required to reach significant levels of LBE participation and to attract and train a pool of local resident workforce qualified to work on the Early Embarcadero Projects. In October 2020, the Port authorized a task to CH2M to produce the overall strategy, including the development of programs and an outreach plan for both LBE support services and workforce development.

The key steps of the task were to (1) produce an overall strategy for both workforce and local business; (2) once specific projects are identified by the Program team, combine the proposed projects with the strategy to develop specific programs each for workforce and local business, and (3) implement the workforce and local business programs and report on the results of each during the duration of the projects. Due to the change in the project development schedule, and a delay in the selection of the Embarcadero Early Projects and identification of a preferred alternative for each Embarcadero Early Project, CH2M was only able to complete items 1 and 2 of the original scope.

The key deliverables submitted by CH2M are listed in Table 5 below.

Table 4: LBE Support Services & Workforce Development Services Deliverables	
LBE Support Services	Workforce Development
LBE Survey	Workforce Preparation and Training Curriculum
LBE/SBE/DBE Engagement and Assessment Memo	Construction Projects Labor Demand Memo
LBE Construction Contractor Meetings Guide	Worker Availability Report
LBE Opportunities page on the WRP website	Workforce Strategies Implementation Guide
Contractor Engagement Guide for LBE Outreach	Pre-Employment Apprenticeship Outreach Plan

This work is just now being finalized for review by Port staff and has not been presented to the Port Commission as the Port review is still underway.

Equity Phase B (Task 1.05.02) and Equity Implementation Plan (Task 2.01.06)

The Waterfront Resilience Program is committed to supporting the Port's Racial Equity Action Plan's goals by advancing Equity across all its plans and activities.

The key deliverables for the equity tasks include an equity work plan and charter, an equity statement for the Program, an equity evaluation framework, and an equity public-facing document. The Port is committed to eliminating racial disparity in all its policies, processes, decisions, and resource allocations, ensuring that the San Francisco waterfront is a place that intentionally welcomes everyone, celebrates diversity and measures its success by how its services and governance champion equity. Each of these deliverables will lay the foundation for the Program to make informed equity considerations through the remainder of the planning process, design, and implementation. This work is just now being finalized for review by Port staff and has not been presented to the Port Commission.

Funding Task (Task 2.01.02)

The Program team has aggressively pursued other Program funding sources, including federal grants and state funding, to leverage Proposition A Seawall Earthquake Safety Bond funding.

Under this task, the Port team learned a challenging lesson applying for funding from the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program: projects whose major focus is to reduce earthquake risk did not compete well for federal grants under then-existing cost-benefit analysis rules, including the Office of Management and Budget's (OMB) 7% discount rate¹⁵. The Port subsequently joined the City's Chief Resilience Officer and other U.S. cities in advocating for a lower federal discount rate. As of this writing, OMB has published a draft revision to its rules revising the federal discount rate to 1.7%-2% which will enable more projects to qualify for federal funding.

In 2022, the Program applied to the FEMA Building Resilient Infrastructure and Communities (BRIC) program for \$50 Million to partially fund the Downtown Coastal Resilience Project. The application was selected for further review in a national FEMA BRIC competition, which indicates a likelihood of award, pending additional Requests for Information. This project is an early flood risk mitigation project in the Ferry Building area (and has a strong benefit-cost ratio).

Also in 2022, the Program, in partnership with SFMTA, applied for \$18.4 million to advance transit and transit facility planning in Islais Creek through DOT RAISE. While unsuccessful, DOT designated the application as a project of high merit and encouraged the Port to reapply in the following cycle. After making adjustments that responded to DOT's feedback, the Program reapplied in 2023. This subsequent application was ultimately lost to a proposal from another San Francisco City agency.

Under this task, the Port and PMPEC developed strategies to develop potential state funding sources for the Program. In 2022, the Port advocated for sea level rise adaptation funding for ports and urban waterfronts and succeeded in obtaining budget State budget allocations to the California Coastal Conservancy of \$143.5 million over three fiscal years starting 2022-23. This is the source of funding for the California Coastal Conservancy grant on this Port Commission calendar.

¹⁵ FEMA, like many other federal granting agencies, uses a *benefit-cost ratio* to determine eligibility for funds. Costs for earthquake retrofits to achieve a re-occupancy performance standard are typically very high, and earthquakes are rare. When earthquake damages are annualized over time based on probability of occurrence in a given year and then discounted back to today's dollars using the OMB's 7% discount rate, avoided damages (or benefits) generated by an earthquake retrofit project are usually lower than project costs.

In 2023, the Port has advocated for sea level rise adaptation funding for ports and urban waterfronts in the Climate Bond still under consideration for the November 2024 ballot. SB 867 (Allen) – not yet adopted – contains \$500 million in funding to the California Coastal Conservancy for coastal and combined flood management projects and activities for developed shoreline areas, including areas with critical infrastructure, including transportation and port infrastructure at risk of current flooding and flooding due to sea level rise.

EXHIBIT D
PMPEC Contract Tasks and Deliverables

	Year	Task	Activity Name	Final Document Date
1	2018	1.09	Final USACE Feasibility Study Strategy	4/10/2018
2	2018	1.01	Final Baseline Schedule	4/18/2018
3	2018	1.04	Final Planning Process/CEQA/NEPA Options Technical Memo	5/10/2018
4	2018	1.01	Final Baseline Schedule V3	5/8/2018
5	2018	1.02	Seawall Assessment Summary Findings Report	5/10/2018
6	2018	1.04	Final RAWG Technical Memo	6/14/2018
7	2018	1.01	Final PMWP	6/26/2018
8	2018	1.02	Program Development Stakeholder Strategy	7/9/2018
9	2018	1.03	Final Permit Applications	8/16/2018
10	2018	1.04	Seismic Basis of Assessment and Design Criteria Report	9/6/2018
11	2018	1.04	Flood Risk Assessment Methodology	9/18/2018
12	2018	1.04	Flood Risk Assessment Methodology	11/6/2018
13	2018	1.03	Pilot Study Additional Investigations Tech Memo	10/26/2018
14	2018	1.04	Economic Impact Assessment Methodology	11/6/2018
15	2018	1.03	Report Summarizing BOAT Map and Multi-Beam Survey	11/15/2018
16	2019	1.03	Main Geotechnical Site Exploration Program	5/23/2019
17	2019	1.03	Data Inventory Report and Recommendations for Additional Investigations Technical Memo	5/23/2019
18	2019	1.04	Flood Risk Assessment Methodology	6/28/2019
19	2019	1.04	Marine structure open area casualty rate memo	11/22/2019
20	2019	1.04	Slide deck for the presentation of casualty analysis methodology	11/22/2019
21	2019	1.04	Occupancy Estimation Methodology Memo	11/22/2019
22	2019	1.04	Slide deck for presentation of occupant estimate	11/22/2019
23	2019	1.03	Data Inventory Report and Recommendations for Additional Investigations Technical	12/17/2019
24	2019	1.04	Final Workshop #1 Memorandum	2/1/2019
25	2020	1.03	Data Inventory Report and Recommendations for Additional Investigations Technical Memo	1/17/2020
26	2020	1.02	Meeting Memo and Deck, Public Workshop 5	1/29/2020
27	2020	1.03	Final Interpretative Report	2/3/2020
28	2020	1.04	Finalize Hazus Runs	2/3/2020
29	2020	1.02	Final meeting memo and deck USACE Workshop 3	2/25/2020
30	2020	1.02	Final meeting memo and deck USACE Workshop 3	2/25/2020
31	2020	1.05	Final Incubator Report and PowerPoint	3/16/2020
32	2020	1.04	Final Embarcadero Seawall Program Coastal Flood Hazard Report	3/31/2020
33	2020	1.05	Final Workshop Summary Memo	6/6/2020
34	2020	1.04	Final Public Realm Assets and Risks: Multi-Hazard Risk Assessment Urban Design Considerations and Assessment Report	6/15/2020
35	2020	1.04	Historic Assets and Risks: Multi-Hazard Risk Assessment Urban Design Considerations and Assessment Repo	
36	2020	1.04	Final Disaster Response and Recovery Assessment Report	6/24/2020
37	2020	1.04	Economic Risk Assessment Report – The Cost of Inaction, Embarcadero Seawall Program. Prepared for Port of San Francisco.	7/20/2020
38	2020	1.04	Utility & Mobility EQ & Flood Risk Assessment	7/27/2020
39	2020	1.04	Utility & Mobility EQ & Flood Risk Assessment	7/27/2020
40	2020	1.04	Land Use and Maritime Assessment Tech Memo	7/27/2020
41	2020	1.01	Final Cost Estimation Principles	8/28/2020
42	2020	1.04	Final Economic Risk Assessment Report	9/24/2020
43	2020	1.04	Final Economic Risk Assessment Report V2	9/29/2020
44	2020	1.09	Final Subarea POCCs	9/29/2020
45	2020	1.05	Final Subarea Flood Risk Profile Sheets	9/29/2020
46	2020	1.05	Final Envision Workshop Summary Memo	10/5/2020

	Year	Task	Activity Name	Final Document Date
47	2020	1.04	Public Life Survey	10/13/2020
48	2020	1.09	FA. Final Structural, Nature-Based, and Non-Structural Flood Measures Fact Sheets	10/14/2020
49	2020	1.02	Meeting Memo and Deck Public Workshop 6, Final	11/3/2020
50	2020	1.04	Utility & Mobility EQ & Flood Risk Assessment	11/6/2020
51	2020	1.05	Bulkhead Wharf Elevation Study Work TM, Final	12/3/2020
52	2020	1.05	Draft Bulkhead Wharf Elevation Study Work Presentation, Final	12/3/2020
53	2020	1.09	USACE.FA Cost Estimates TM, Final	12/24/2020
54	2021	1.09	Final GIS geodatabase: updated 1-meter DEM, landward alignments, and associated ground and flood elevations, Final	2/24/2021
55	2021	1.09	Tabular database: updated 1-meter DEM, landward alignments, and associated ground and flood elevations, Final	2/24/2021
56	2021	1.05	Seismic Solution Strategies Study, Presentation - Final	3/23/2021
57	2021	1.09	Meeting Memo and Deck. USACE Public Workshop 6, Final	4/15/2021
58	2021	1.05	Seismic Solution Strategies Study, Seawall Measures Technical Memo	4/15/2021
59	2021	1.05	Memo Summarizing Outcomes of Workshop 1, Final	4/23/2021
60	2021	2.04	Jefferson Street Wharf J5 General Stability Memo, Final	6/3/2021
61	2021	1.05	Preliminary Findings PPT reflecting Port feedback, Final	7/9/2021
62	2021	1.05	Envision Concepts Report, Final	7/12/2021
63	2021	1.05	Envision Concept Presentation	7/15/2021
64	2021	1.01	Baseline Schedule Update, Final V2	7/26/2021
65	2021	1.05	Envision Concepts Presentation, Final V3	8/6/2021
66	2021	1.05	Final Pier 45 Charette Executive Summary Document	9/29/2021
67	2021	1.09	Final Shoreline Alignments (GIS Files)	10/8/2021
68	2021	1.09	Final geodatabase of alignments, water levels, and wave height information (data files)	10/8/2021
69	2021	1.09	Final Shoreline Explorer (online visualization tool)	10/8/2021
70	2021	1.05	Draft meeting notes from all of the Northern Waterfront Geographic Adaptation Strategy Development Workshops.	10/12/2021
71	2021	1.05	Draft Southern Waterfront Summary of Existing Resilience Info	10/13/2021
72	2021	2.02	Memo on Community Engagement in 1st half of 2021, Final	10/14/2021
73	2021	2.04	Location, Panels, Testing and Monitoring, Final Memo with Drawings and Installation description AND Location, Panels, Testing and Monitoring, Final Draft Testing and Installation memo	10/21/2021
74	2021	1.04	Final Report, IP, Exec Summary and PPT	10/25/2021
75	2021	1.04	Final Embarcadero Seawall Program Coast Flood Hazard Report	11/9/2021
76	2021	1.05	Final "Southern Waterfront Summary Existing Resilience Information Technical Memo" Mission Creek/Mission Bay	11/26/2021
77	2021	1.05	Final "Southern Waterfront Summary of Existing Resilience Information Technical Memo". Islais Creek/Bayview	11/26/2021
78	2021	1.10	Training and Curriculum Needs and Requirement Memo, Final	12/14/2021
79	2022	1.05	Final "Southern Waterfront existing information Resilience Brief". Islais Creek/Bayview	1/4/2022
80	2022	1.05	Final "Southern Waterfront existing information Resilience Brief". Mission Creek / Mission Bay	1/4/2022
81	2022	2.02	Final Meeting Memo and Deck. Public Workshop 7	2/8/2022
82	2022	1.05	Final Third Street Bridge Charrette Technical Memorandum	4/13/2022
83	2022	1.10	Final Internship Worksite Guidelines	4/13/2022
84	2022	1.01	Final MHRA TM	4/13/2022
85	2022	1.01	Final Benefitting Area Analysis TM	4/13/2022
86	2022	1.04	Final Benefit-Cost Analysis Methodology TM	4/13/2022
87	2022	2.02	Final Memo on Community Engagement in 2nd half of 2021	4/13/2022
88	2022	1.05	Final Summary ppt Evaluation of Potential Impacts on Embarcadero National Register Historic District Pier Resources	4/19/2022

	Year	Task	Activity Name	Final Document Date
89	2022	1.05	SF WRP Early Projects Evaluation Technical Memo, Final	5/18/2022
90	2022	1.05	Final Excel Spreadsheet of Assets by Type	5/24/2022
91	2022	1.05	Final Technical Maps	5/24/2022
92	2022	1.05	Final High-Level Adapt Approaches TM	7/15/2022
93	2022	1.10	Final LBE/SBE/DBE Engagement and Assessment Memo	8/10/2022
94	2022	2.02	Final Memo on Community Engagement in 1st Half of 2022	8/31/2022
95	2022	1.01	Final Discovery Phase Summary of Findings Presentation AND Final Roadmap to Equity	9/28/2022
96	2022	1.09	Final Story Boards (Pdf of Miro Board)	10/18/2022
97	2022	1.10	3QT Internship Report	10/18/2022
98	2022	2.03	Wharf J9 NAR. Final NAR ppt	10/19/2022
99	2022	2.03	Wharf J9. Final NAR	10/21/2022
100	2022	2.03	Pier 15 EQ Safety Retrofit NAR, Final NAR ppt	10/25/2022
101	2022	2.03	Pier 15 EQ Safety Retrofit NAR, Final NAR	10/25/2022
102	2022	2.03	Pier 9 EQ Safety Retrofit NAR. Final NAR ppt	10/25/2022
103	2022	2.03	Pier 9 EQ Safety Retrofit NAR, Final NAR	10/25/2022
104	2022	2.03	FB SSEQR Project NAR. Final NAR ppt	11/15/2022
105	2022	2.03	P5-22 Flood RR Project NAR. Final NAR ppt	11/23/2022
106	2022	2.03	P5-22 Flood RR Project NAR. Final NAR	11/23/2022
107	2022	2.03	P24-28 EQ Safety Retrofit NAR. Final NAR	11/28/2022
108	2022	2.04	SF Living Seawall. Final Health and Safety Plan	12/23/2022
109	2023	2.04	Final Baseline Survey Memo	1/11/2023
110	2023	1.10	Final Workforce Stakeholder Database	1/11/2023
111	2023	2.02	Final Meeting Memo and Draft Deck Public Workshop 8	2/6/2023
112	2023	1.05	Final Phase A Strategies TM	2/8/2023
113	2023	1.05	First Order Equity Evaluation Framework	3/28/2023
114	2023	1.09	USACE NEPA Prepare Notice of Intend (USACE Study Red Analysis TM)	4/4/2023
115	2023	2.03	Pier 9 EQ Retrofit AAR. Final Prelim Evaluation Memo	4/25/2023
116	2023	1.09	Final Coast Storm Report (part of HH&C Sub-appendix)	4/25/2023
117	2023	1.10	Final Pre-Employment Apprenticeship Outreach Plan TM	5/17/2023
118	2023	2.01	Modified Discount Rate Final TM	6/2/2023
119	2023	2.03	Wharf J9 Replacement AAR. Final Prelim Evaluation Memo	6/13/2023
120	2023	2.02	Final Brief Summary Report for February and March 2023 Engagement	6/13/2023
121	2023	2.03	Wharf J9 Dock. Final Basis of Design Report	8/4/2023
122	2023	1.10	2023 2QT Internship Report	8/11/2023
123	2023	1.05	Final Flood Management Policies and Tools Technical Memorandum	8/14/2023
124	2023	1.09	Final Sea Level Change and Future Extreme Precipitation sections (part HH&C Sub-appendix)	9/8/2023
125	2023	2.03	P35 EFW Final NAR	9/12/2023
126	2023	1.10	Final Contractor Engagement Guide for LBE Outreach	11/16/2023
127	2023	2.03	Pier 9 Final AAR Report	11/22/2023

EXHIBIT E

Embarcadero Seawall Multi-Hazard Risk Assessment Key Take-Aways

The MHRA is an extensive assessment of earthquake and coastal flood risks along the waterfront. This analysis has shown that risk varies significantly along the waterfront and the findings will be used to inform the design of strategies to reduce this risk. Section 4 provides additional high-level findings per discipline, but the following key takeaways stand out:

- **The aging and vibrant Embarcadero waterfront presents a complex problem for seismic and flood resilience improvements that are needed to lower the risk for both the Port and the City.**
- **The Port's aging seawall is not the only source of earthquake risk.** Weak soil behind and under the seawall and the interaction between the seawall and adjacent historic pile-supported structures contribute to earthquake risk. With strong ground shaking, weak soil under the Embarcadero will settle and cause extensive damage regardless of whether the seawall moves toward the Bay.
- **Up to 40,000 people could be at risk on Port property if an earthquake occurs during the day.** The Agriculture Building, timber pile-supported buildings in Fisherman's Wharf, and historic wharves connected to the seawall in the Embarcadero Historic District have high occupancy combined with higher collapse risk.
- **The Ferry Building area is one of the highest-risk areas on the waterfront.** A large earthquake will cause significant settlement and lateral spreading in this area, threatening life safety and disaster response efforts as well as many of the day-to-day functions along the waterfront. The Ferry Building itself requires further seismic analysis to understand its likely earthquake performance. This area is the lowest point along the Embarcadero, making it the first section to be impacted by coastal flooding, with king tides already causing some overtopping. The Ferry Building itself is at the edge of the current 100-year flood zone. The Port's public outreach confirmed that stakeholders love this area and recognize the concentration of transportation modes and the area's historic significance.
- **The Embarcadero roadway has significant seismic risk, which could impact disaster response and local and regional transportation.** Due to the presence of weak soil, the Embarcadero transportation and utility corridor is at significant seismic risk. In a 1906-size earthquake, damage to the seawall and Embarcadero may be severe enough to significantly hamper disaster response efforts along the waterfront. A more likely earthquake like the 1989 Loma Prieta earthquake – but centered close to San Francisco – is expected to lead to the loss of the Embarcadero as a transportation route for up to 1 year.
- **Older, timber-pile-supported structures in Fisherman's Wharf are at high risk.** These older, pile-supported structures are home to small businesses and workers catering to visitors and residents. These structures are vulnerable to strong ground-shaking and lateral spreading expected in a moderate to large earthquake.
- **Many historic buildings and bulkhead wharves are at high risk.** The bulkhead wharves are the structures located where the pile-supported piers over the Bay meet the land. These structures are interconnected with the seawall and support the ornate, historic bulkhead buildings that line the Embarcadero. These structures are at high risk of earthquake damage and will flood with increasing sea levels.
- **In the South Beach subarea, earthquake instability of the seawall is lower than previously thought.** Lateral spreading and seawall movement are not expected to be a

problem in the area, but strong ground shaking is expected to damage the wharves and the roadway.

- **The economic consequences of inaction to San Francisco and the wider region are extensive.** Without action, earthquakes will cause loss of life and casualties along the waterfront, diminish the City and Port's capacity to respond to a disaster, and impact key utility and transportation systems, including the Embarcadero roadway. Without new flood protection, coastal flooding of the Embarcadero through low points on the shoreline will cause significant damage by 2050 and a steadily increasing risk of catastrophic flooding to the Embarcadero Muni Tunnel with potential system-wide impacts to BART and Muni.
 - Combined earthquake and flood impacts at the Embarcadero waterfront are expected to cause **as much as \$30 billion of economic losses due to damage and disruption by 2100.**
 - Port- and Embarcadero-related earthquake losses are a near-term problem with \$0.9 billion in losses estimated by 2050 and \$1.5 billion estimated by 2100.
 - Flood losses are an emerging problem that increases significantly as sea-level rise begins to overtop the seawall. Based on the State of California's most likely and high sea-level rise projections, coastal flood losses are expected to range between \$4.5 billion and \$29 billion on average by 2100. The Embarcadero will experience frequent, disruptive flood impacts several decades before the Port's piers experience flood damages, which are on average 2 feet higher than the roadway.
- **There is a significant flood risk to the waterfront and inland neighborhoods, including the Northern Waterfront, Financial District, and South Beach.** The seawall and bulkhead wharves currently provide 100-year flood protection for most of the Embarcadero waterfront, with exceptions such as in the Ferry Building area. However, sea-level rise will decrease the level of flood protection this infrastructure provides, causing the Embarcadero and adjacent inland neighborhoods to become increasingly at risk for coastal flooding. San Francisco's hard bayfront edge and relatively flat topography of the filled lands behind the seawall are very sensitive to changes in water level once the seawall and shoreline are overtopped. When the water level is 3 feet higher than the shoreline, the floodplain extends into the Financial District by more than 0.25 mile, affecting neighborhoods, small and large businesses, jobs, utilities, regional and citywide transportation, maritime function, and cultural and historic resources. The sensitivity of San Francisco's bayside shoreline to flood risk thresholds makes it critical that a risk-informed approach is taken to increase flood protection.
 - **Today, the waterfront segment between Pier 7 and Rincon Park falls below the 100-year flood protection standard and as sea level rises, other areas will also fall below this protection standard.**
 - **At approximately 1 foot of sea-level rise, anticipated to occur between 2035 and 2050, the Embarcadero roadway and surrounding buildings near the foot of Market Street will be significantly inundated during a 100-year extreme tide, resulting in damages and disruption along with severe impacts to over 1 million trips taken by BART and Muni riders.** Repairs to the transit systems could take months to years to fully repair and replace all damaged components.
 - **At just over 2 feet of sea-level rise, expected to occur between 2050 and 2075, the Embarcadero roadway and promenade will reach a tipping point where the 100-year flood causes widespread overtopping of the shoreline, resulting in significant**

disruption to multi-modal movement, cutting off landside access to all Port facilities and flooding the Financial District nearly to Beale Street. Such widespread flooding results in severe disruption and damage to the entire Embarcadero corridor and historic district, along with hundreds of other small businesses, residential and commercial uses, jobs, and critical services, impacting not only the City but the greater Bay Area region. Additionally, access to Port infrastructure via the Embarcadero is cut off which is expected to eliminate the ability for the Port to carry out its public trust responsibilities and maintain and operate critical City, State, and Port assets and services.

- The MHRA findings will provide important information to guide alternative development, decision-making, and prioritization of projects, funding, and action along the waterfront. In addition to the MHRA, the Waterfront Resilience Program conducted robust community and stakeholder engagement including a community meeting series, presentations to and discussions with advisory groups and advisory committees, online engagement, and hosting of and participation in community events to ensure broad engagement. The results of this deep engagement provided the Port with an understanding of community priorities, concerns, and input on the Waterfront Resilience Program vision, principles, goals, and evaluation criteria. With the MHRA findings and the findings from the community engagement, the Port can move forward to develop alternatives that will respond to both risks and community priorities.

EXHIBIT F Seismic Measures Development Key Findings

The purpose of the Seismic Measures Development task was to estimate the efficacy, feasibility, and cost of select measures to reduce seismic risks and, thus, to inform the development of alternatives, to assist in their evaluation, and to contribute to the selection of projects. The key findings are:

- Achieving seismic safety and resilience requires a combination of measures that collectively address shoreline instability and liquefaction and the impacts these and ground shaking have on City, Port, and private assets.
- Mitigating the liquefiable fills using ground improvement techniques will likely do little to reduce shoreline instability between Piers 1 and 35 but could be used to reduce settlements due to liquefaction. A test program would be needed to provide more certainty regarding the efficacy and cost of ground improvement techniques given the conditions within the study area.
- Drilled shafts, a super bulkhead wharf, a nearshore buttress, and a landside buttress would reduce shoreline displacements and improve the seismic performance of the bulkhead wharves, utilities, the promenade, the Embarcadero, and the F-Line to varying degrees. Supplemental measures, sometimes minor in scope by comparison, would further improve asset performance. For example, adding a tie between a wharf and the drilled shafts and adding a seismic joint between the wharf and the adjoining pier would improve the seismic performance of the wharf.
- Construction of some shoreline stabilization measures would be highly disruptive to the Embarcadero and promenade users. Detours would be needed. Some measures can be constructed from the water using barges to limit these impacts. Some measures would require vacating the adjoining pier during construction.
- Construction costs for the four shoreline stabilization measures vary as shown in Figure ES-1. Costs are largely a function of soil stratigraphy; shoreline stabilization between Piers 1 and 17 is the most expensive to achieve due to the deep Young Bay Mud.

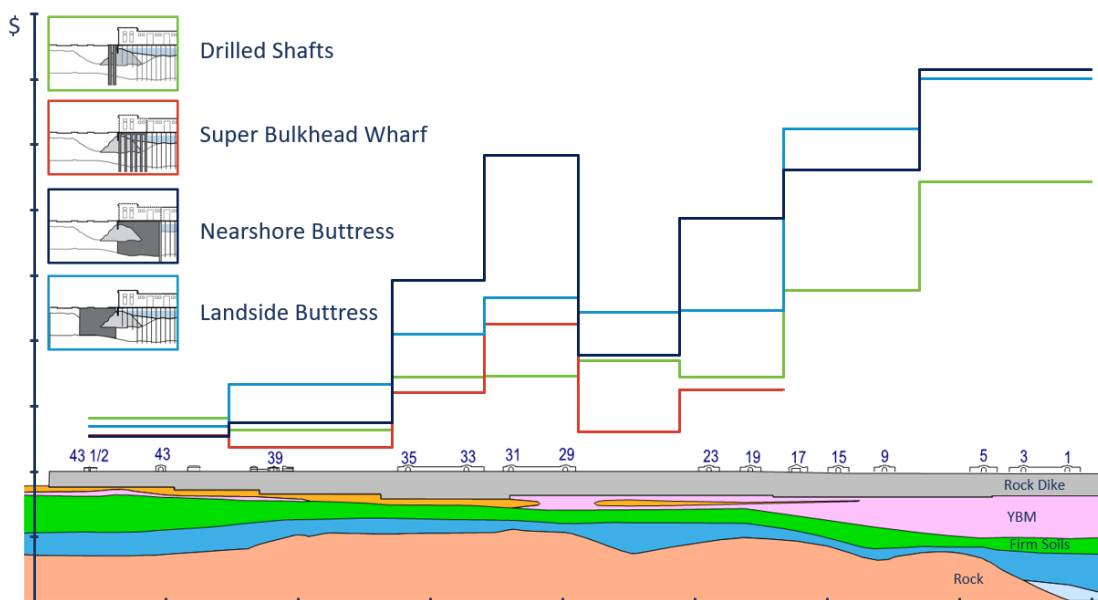


Figure ES-1. Shoreline Stabilization Measure Relative Costs

- Other major cost drivers include the impacts on existing infrastructure necessary to stabilize the shoreline, construction access, and public detours. Temporary relocation and replacement of bulkhead wharf buildings and portions of the piers are major cost components of measures that involve wharf replacements.
- Marine-based construction is more expensive than land-based as more demolition and replacement of pier sections are required to accommodate barges.
- For the nearshore seawall, trellis-based construction may offer cost savings over marine-based.
- The location of coastal flood protection informs the selection of shoreline stabilization measures and vice-versa.
- Surface and subsurface conditions between Piers 1 and 43 ½ vary significantly. The most cost-effective shoreline stabilization measure combined with the necessary supplementary seismic measures and adaptation measures varies by location.
- Bulkhead wharf retrofits can more readily achieve the chosen performance criteria when coupled with an effective shoreline stabilization measure.

Recommendations for Future Work

The [PMPEC] recommends the Port initiate the following activities to advance certainty regarding the impacts and benefits associated with the various measures described in this report.

- Variations of the measures described in this report and combinations of measures can be studied as part of the Alternatives process. For example, the use of tiebacks to stiffen drilled shafts super bulkhead wharves can be considered.
- Additional study to better estimate utility and mobility seismic performance improvements is recommended. This would include identifying the utilities most vulnerable to liquefaction-induced settlements so that additional field explorations and subsequent analyses are more targeted, evaluating the feasibility and efficacy of utility retrofits, and evaluating the benefit versus cost of various measures and combinations of measures and comparing these to post-earthquake repair costs.
- Benefit and cost analyses would be useful for evaluating measures with different costs and different benefits. This would include comparing construction methods. For example, super bulkhead wharf construction using marine operations would provide a new deck area that can be elevated in preparation for sea level rise. The benefit of this could be quantified and used to compare the method to landside construction operations.
- Given the significance of the historic building relocation and dismantling costs, a more thorough study of the techniques, transport options, berthing options for barge transport, storage options, and other relevant items should be conducted.
- A study to evaluate groundwater migration and risk of emergence study should be conducted.

Constructability considerations and cost estimates should be developed for the pile pinning measure.

Table 0-1. Shoreline Stabilization Measure Cost Estimates – Total Construction Cost (w/markups)

	Piers 1–7	Piers 9–17	Piers 19–23	Pier 27	Piers 29–31	Piers 33–35	Piers 35½–41	Piers 41½–43½
Drilled Shaft Measure Total Construction Cost								
Low	\$313,000,000	\$184,000,000	\$102,000,000	\$106,000,000	\$93,000,000	\$90,000,000	\$123,000,000	\$111,000,000
High	\$508,000,000	\$299,000,000	\$165,000,000	\$172,000,000	\$151,000,000	\$146,000,000	\$199,000,000	\$181,000,000
Super Bulkhead Wharf – Marine Operations Total Construction Cost								
Low	NA	NA	\$109,000,000	\$85,000,000	\$141,000,000	\$106,000,000	\$98,000,000	\$102,000,000
High			\$177,000,000	\$137,000,000	\$228,000,000	\$172,000,000	\$159,000,000	\$165,000,000
Super Bulkhead Wharf – Landside Operations Total Construction Cost								
Low	NA	NA	\$75,000,000	\$72,000,000	\$108,000,000	\$83,000,000	\$107,000,000	\$97,000,000
High			\$122,000,000	\$116,000,000	\$175,000,000	\$134,000,000	\$174,000,000	\$158,000,000
Nearshore Buttress Total Construction Cost								
Low	\$260,000,000	\$343,000,000	\$105,000,000	\$104,000,000	\$162,000,000	\$123,000,000	\$113,000,000	\$94,000,000
High	\$422,000,000	\$557,000,000	\$170,000,000	\$168,000,000	\$262,000,000	\$199,000,000	\$184,000,000	\$153,000,000
Landside Buttress Wharf Total Construction Cost								
Low	\$374,000,000	\$263,000,000	\$116,000,000	\$123,000,000	\$112,000,000	\$104,000,000	\$151,000,000	\$111,000,000
High	\$607,000,000	\$426,000,000	\$188,000,000	\$200,000,000	\$181,000,000	\$168,000,000	\$246,000,000	\$179,000,000

Notes: NA = Not applicable

Construction costs include general conditions, contractor overhead and profit, bonding, and other hard cost markups. The ranges represent an accuracy of –20 to +30 percent with an 80 percent confidence level. **Soft costs would be an additional 30 to 50 percent.**

EXHIBIT G

Communications and Stakeholder Engagement

Since 2017, the Port's Waterfront Resilience Program has connected with tens of thousands of people through robust community engagement efforts to advance work on the MHRA, Embarcadero Early Projects, and the USACE Flood Study. This included engaging community members, businesses and merchants, advisory committees, non-profit groups, and others, and educating them about the aging Embarcadero Seawall to ensure that the MHRA findings would be accompanied by an understanding of community and stakeholder priorities, concerns, and issues. All community engagement (including community meetings, presentations to groups, tabling at local neighborhood events, and online engagement) also offered the public an opportunity to provide the Port key feedback on Program priorities.

Community Meetings

Tables F1-F3 below include a high-level overview of what the Port presented and heard at each community meeting for the Embarcadero waterfront. Of note, many community meetings were accompanied by a parallel digital engagement activity.

Other Engagement

In addition to community meetings, the WRP developed other modes of community outreach to broaden and diversify the reach of the program's engagement efforts. These included digital engagement opportunities through the program website (sfport.com/wrp), in-language Spanish and Chinese communications, and event-based engagement.

City Engagement

In addition to the outreach and engagement detailed above, the Port also engaged city partners. The focus of these presentations and ensuing discussions included understanding more about priority assets along the waterfront, along with ideas for improving seismic and flood safety, working closely with teams from Public Works, SFPUC, SFMTA, BART, and others to better understand potential impacts to infrastructure and assets, and ongoing close coordination on mid- and long-term planning to help inform Proposition A Projects.

Community Advisory Group Engagement

Since 2017, the Port team coordinated over 115 community and stakeholder group presentations, 12 of which were conducted in languages other than English. This engagement included presentations and discussions with advisory groups and advisory committees. The standard format for this engagement included a 15-minute presentation describing the WRP, the hazards and potential risks and consequences relevant to the group, the adaptation planning framework, the projects within the program, and community engagement approach, and opportunities for input. These engagements led to important discussions about the WRP, the projects and the Port and city priorities. The Port continues to collaborate with local advisory groups, including regular presentations and opportunities for input.

How did this engagement effort inform our work?

Based on this robust engagement, the Port heard the following key messages across the waterfront:

- Prioritize life safety, emergency response, and critical facilities.
- The Embarcadero Promenade and the Ferry Building are two of the most consistently beloved assets along the waterfront.
- Bay ecology, the Bay as an open space, Bay views, and nature and ecology are important to everyone along the waterfront.
- Transportation and utilities are also prioritized.
- Community members consistently stated that the focus of the WRP should be on city and Port assets that serve the whole city.

- There is a strong desire for a robust and waterfront-wide pedestrian and bicycle corridor that provides safe and enjoyable access for commuting, recreating, and traveling from the southern waterfront to the northern waterfront.
- Jobs and economy are important throughout the waterfront and preserving and enhancing job centers such as Fisherman's Wharf, Islais Creek and the Financial District was important to many

More specifically, the Port sought feedback on Program principles, Vision and Goals, and evaluation criteria. Community feedback strongly affirmed the Port's draft vision and goals, and the public encouraged the Port to:

- Continue to be transparent and accountable
- Continue to engage communities
- Prioritize life safety and emergency response
- Prioritize sustainable and nature-based solutions where possible
- Prioritize assets most loved by the community and most important to the city
- Prioritize projects that use tax dollars effectively and responsibly

And, finally, while community feedback carried many universal themes, there were some specific concerns related to each geography along the waterfront. What follows is what we heard that resonated as distinct feedback for each of the three waterfront geographies:

Embarcadero Waterfront

- Key community-prioritized assets include: the Muni Tunnel, Ferry Building, Exploratorium, Fisherman's Wharf
- We heard the importance of increased transportation options, open spaces and parks, and more family-friendly activities
- We heard a desire to preserve and enhance jobs and the diversity of jobs along the Embarcadero
- The Embarcadero Promenade is viewed as a critical asset and there is a strong desire to preserve and enhance it

Mission Creek / Mission Bay Waterfront

- Key community-prioritized assets include: the Giants ballpark, water and public space access, the environment
- We heard the importance of prioritizing homes, including low-income housing
- Environmental issues were highlighted, including Mission Creek as an ecological and open space asset
- We also heard how vital it is to reach youth via our public engagement effort

Islais Creek / Bayview Waterfront

- Key community-prioritized assets include: Recology, the Southeast Treatment Plant, UCSF, cargo and maritime operations
- We heard the importance of prioritizing homes, including low-income housing
- We heard to prioritize environmental concerns, including historic contamination, and ensure anti-displacement is centered in any work.
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Table G-1: Embarcadero Community Meetings					
Meeting	Date	Topic	Description	Public Feedback	Slide Deck
#1	Jun-18	Introduction	Presented the project, the problems, the Port's adaptation planning framework, and the Seawall Program goals.	Solicited public feedback on the waterfront's future.	DECK
#2	Sep-18	Assets and Risks	Presented more detail about the seismic and flood risks. Ask the public what they love about the waterfront and what is important to the City.	Public feedback confirmed the Port's focus on life safety and emergency response.	DECK
#3	Jan-19	Goals and Tradeoffs	Presented the planning framework and how it will help the Port make strategic decisions over time to increase the resilience of the waterfront. Solicited feedback on the Program goals and priorities, and tradeoffs in the three planning horizons.	Public feedback confirmed the Port's draft goals felt appropriate.	DECK
#4	Jun-19	Framework, Vision, Principles, Evaluation Criteria	Presented an overview of the WRP, introduced the MHRA, Program vision, principles, and evaluation criteria.	Public feedback confirmed the Port's draft principles and draft evaluation criteria felt appropriate. Attendees prioritized the Ferry Building and surrounding area as a key asset.	DECK
#5	Dec-19	MHRA Approach and Findings	Presented the MHRA approach and the progress being made.	Public feedback included many questions and comments across MHRA topic areas.	DECK
#6	Sep-20	Introduction to Measures	Presented a recap of MHRA key findings and introduced measures as strategies for addressing waterfront risks.	Public feedback indicated a willingness to trade off higher costs for a longer design life, a willingness to pay higher costs to protect iconic and cultural buildings, and limiting the impact on the waterfront with projects that wouldn't need to be updated or replaced.	DECK
#7	Dec 21- Jan-22	Introduction to Embarcadero Early Projects	Presented Embarcadero Early Projects as near-term actions focused on improving life safety and citywide disaster response capabilities in the areas of the highest earthquake and sea level rise risks along the Embarcadero Waterfront.	Public feedback indicated a preference for maximizing access to the shoreline and waterfront facilities during construction, exploring environmental solutions, and minimizing negative impacts on other parts of the waterfront and the City.	DECK
#8	Oct- Dec-22	Draft Waterfront Adaptation Strategies	Hosted 16 events open to the public to solicit feedback on Draft Waterfront Adaptation Strategies, including two online community meetings in the Embarcadero.		DECK

Table G-2: Islais Creek Community Meetings

Meeting	Date	Topic	Description	Public Feedback	Slide Deck
#1	Mar-19	Introduction, Assets, and Risks	Presented the adaptation planning framework, current and future flood risk, WRP initiatives and highlighted the initiatives that are relevant to the Islais Creek/Bayview geography.	Public feedback confirmed the Port's focus on life safety and emergency response and included recommendations to also focus on transportation and mobility, utilities, jobs, ecology and open space, access to recreation, and maritime and industrial uses.	DECK
#1.5	Sep-19	Introduction, Assets, and Risks	To ensure that there was robust participation in the WRP work in the Islais Creek/Bayview area, Community Meeting #1 was held again and promotion of the meeting was significantly increased. The presentation material and engagement exercise were the same as Community Meeting #1, but there was more public participation.	Public feedback confirmed the Port's focus on life safety and emergency response and included concerns and priorities related to all sources of flooding, contamination, jobs, and economy, preserving and protecting neighborhoods and neighborhood spaces, preserving and enhancing cultural resources, critical facilities such as transportation and utility corridors, schools, hospitals and parks and open spaces.	DECK
#2	Jan-20	Goals and Tradeoffs	Presented about the hazards under consideration, feedback from previous community meetings, and draft goals. Introduced an engagement exercise designed to engage participation in the drafting of study goals and educate participants on the need to adapt to the waterfront over time.	Public feedback supported the draft vision statement. The public shared concerns about parts of the Bay shoreline that are not included in the USACE Flood Resilience Study and the Islais Creek Adaptation Study (Yosemite Slough, Bayview/Hunter's Point). Offered that the WRP goals should reflect the following priorities: Avoid displacement and gentrification; Accountability; Intergenerational engagement; Environmental concerns; Transit options and services; Nature-based solutions and the watershed; Jobs, housing, and more recreation.	DECK
#3	Dec-20	CBO Collaboration	Roadshow Presentations: These presentations were 15-20 minutes in length with 10-20 minutes for Q&A. Presentations were made to Community Based Organizations (CBOs), neighborhood committees, and/or convener groups. Co-hosted Meetings: These are co-hosted meetings with a CBO. The presentation was 30 minutes with polls, questions, and other engagement activities.	Stormwater flooding was a recurring issue and area of concern. Concern about gentrification, housing displacement, and how the project would serve and sustain the local community. Raised questions around equity and access to resources, jobs, and training opportunities. Concern about environmental contamination, and exposure to toxic waste.	ROADSHOW DECK / CO-HOSTED MTG DECK

Table G-2: Islais Creek Community Meetings

Meeting	Date	Topic	Description	Public Feedback	Slide Deck
#4	May-21	Islais Creek Southeast Mobility Adaptation Strategy (ICSMAS)	Focused on reconnecting with and reporting back to the community members who had been part of previous ICSMAS engagements. Provided a recap of key ICSMAS findings and created an opportunity for comments on the shared adaptation strategy before submitting the final report.	Concerned about public transit options. Preference for ecological adaptation strategies at the shoreline and green aspects/natural materials in neighborhoods. Expressed a need for pedestrian/bicycle pathways that are separate from cargo/industrial thruways. Requested future land development takes into consideration the land could be used to increase public access to the waterfront. Concern that adaptation strategies don't immediately address diversity, racial equity, systemic racism, and gentrification. Expressed concerns that Islais Creek and marginalized communities won't be prioritized in budgeting decisions with the budget constraints imposed by the COVID-19 pandemic.	DECK
#5	Oct-Dec-22	Draft Waterfront Adaptation Strategies	Hosted 16 events open to the public to solicit feedback on Draft Waterfront Adaptation Strategies, including two online community meetings in Islais Creek.	Concerned about contamination and toxicity, gentrification and displacement, and local workforce opportunities. Excited about increased access to water recreation, restoring natural wetlands, and generating economic opportunities and job creation. Highlighted "enhancing and restoring watersheds and native marsh habitats" and "limiting actions that need to be taken by individuals" as the top-ranked opportunities. Strategies that recommended lower intervention (A and B) or used a lower projected rate of sea level rise (C and D) were not supported. Attendees favored more transformational changes in Strategy E. Strategy F received the most "need more information" responses. A majority supported Strategy G, however, it raised strong concerns including loss of jobs and industrial space, effects on housing, public access improvements leading to gentrification, and individuals taking on the responsibility of adaptation costs.	DECK

Table G-3: Mission Creek Community Meetings

Meeting	Date	Topic	Description	Public Feedback	Slide Deck
#1	Mar-19	Introduction, Assets, and Risks	Presented the adaptation planning framework, current and future flood risk, WRP initiatives and highlighted the initiatives that are relevant to the Mission Creek geography.	Public feedback included focus neighborhoods, critical facilities, hospitals and medical facilities, the Ballpark, transportation and mobility, parks and open space, Mission Creek as an ecological and open space asset.	DECK
#2	Mar-Jul-20	Goals and Tradeoffs	Based on community input, draft goals were developed for the Mission Creek area and were planned to be shared at a series of community “mixers” in the spring of 2020. After one mixer in March 2020 at Port Tenant Atwater Tavern, the mixer series was postponed and the engagement effort was instead shared digitally due to shelter-in-place orders due to COVID-19.		DECK
#3	Jan-Feb-21	CBO Collaboration	Roadshow Presentations: These presentations were 15-20 minutes in length with 10-20 minutes for Q&A. These presentations were made to Community Based Organizations (CBOs), neighborhood committees, and/or convener groups. Co-hosted Meetings: These are co-hosted meetings with a CBO. The presentation was 30 minutes with opportunities for polls, questions, and other engagement activities.	Concerned about the amount of highly technical level of information being presented. Expressed a need to remain apprised of project updates and upcoming meetings. Wanting to hear more about costs and funding strategy. Raised questions around soil subsidence. Interest in protecting and enhancing ecological features of their neighborhoods (e.g. parks and green space).	DECK
#4	Oct-Dec-22	Draft Adaptation Strategies	Hosted 16 events open to the public to solicit feedback on Draft Waterfront Adaptation Strategies, including two online community meetings in Mission Creek.	Concerned about the impact of sea level rise on the combined stormwater and sewer system, the impact of tide gates on mobility and vessel traffic along Mission Creek, the sustainable operations of infrastructure, and the cost-effectiveness of adapting the waterfront. Highlighted “preserving the existing buildings, open spaces, and transportation corridors” and “transforming public spaces through multiuse and floodable spaces” as their highest-ranked opportunities. Strategies that recommended lower intervention (A and B) or used a lower projected rate of sea level rise (C and D) were not supported. Strategy E received broad support, though many participants favored more transformational changes to land use. Strategy F and G received mixed responses.	DECK