MEMORANDUM

September 9, 2022

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

FROM: Elaine Forbes
Executive Director

SUBJECT: Informational presentation regarding progress on the Waterfront Resilience Program Early Projects

DIRECTOR'S RECOMMENDATION: Information Only – No Action Required

EXECUTIVE SUMMARY

At the December 14, 2021 Port Commission meeting, the Port's Waterfront Resilience Program ("WRP") team presented results of the planning effort to identify Embarcadero Early Projects to reduce earthquake and flood risk including Proposition A Seawall Earthquake Safety (Proposition A) projects. The WRP team identified twenty-three (23) potential Embarcadero Early Projects focused on improving earthquake safety, building City and regional disaster response capability, and reducing near-term coastal flood risk.

The estimated total cost range to deliver all of 23 projects is estimated between $650M to $3B, more than current funding from Proposition A. Staff obtained Commission concurrence to advance up to 11 projects and 1 Pier 19-41 Geographic Strategy into pre-design, with the goals of securing additional funding and identifying projects to advance to detailed design and construction with Proposition A funds between 2023 and 2024.

The Program team has been hard at work advancing projects and has completed needs assessment reports (Needs Assessment) for 6 of the priority Embarcadero Early Projects. Needs Assessment is the first of three pre-design steps and is focused on developing an aligned project vision based on input from the public and Port divisions and a wide range of initial project alternatives.

Alternatives analysis and selection (Alternatives Analysis) is the next step, followed by conceptual engineering (or 10% design) at which point the WRP team establishes an initial baseline scope, schedule, budget, and delivery and the WRP team makes a recommendation to advance the project into detailed design and entitlement. The WRP team provided an overview of the WRP project delivery process to the Port Commission at its August 10, 2021 meeting. At that meeting, the Program team shared that we will request Port Commission decision making following the conceptual engineering phase ahead of advancing Early Projects into detailed design.

The WRP remains on track to recommend the first projects for detailed design and entitlement in 2023 and to start construction before the end of 2024. Additional Embarcadero Early Projects from the initial list of 12 identified for pre-design will now advance to the Needs Assessment phase. We also continue to advance the longer-term adaptation strategies, advance the USACE San Francisco Waterfront Coastal Flood Study in partnership with the United States Army Corps of Engineers, and seek grant funding and private partnerships to deliver additional Early Projects and longer-term adaptation planning.

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 Waterfront Resilience Program and Flood Study.

Equity
By developing a program-wide equity strategy and evaluating waterfront adaptation strategies through an equity lens to ensure that benefits accrue to, and burdens are minimized for BIPOC communities, and by increasing the proportion of funds spent on contract services performed by LBE firms.

Evolution
By developing options for Early Projects to be adapted over time, recognizing that decisions made today influence the options available to future generations who will be addressing different environmental and social conditions.

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

Sustainability
By incorporating nature-based features into Early Projects where possible to enhance the quality of the Bay water and habitat with the improvements.

Productivity and Economic Recovery
Through wise investment of Proposition A Seawall Earthquake Safety Bonds 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.

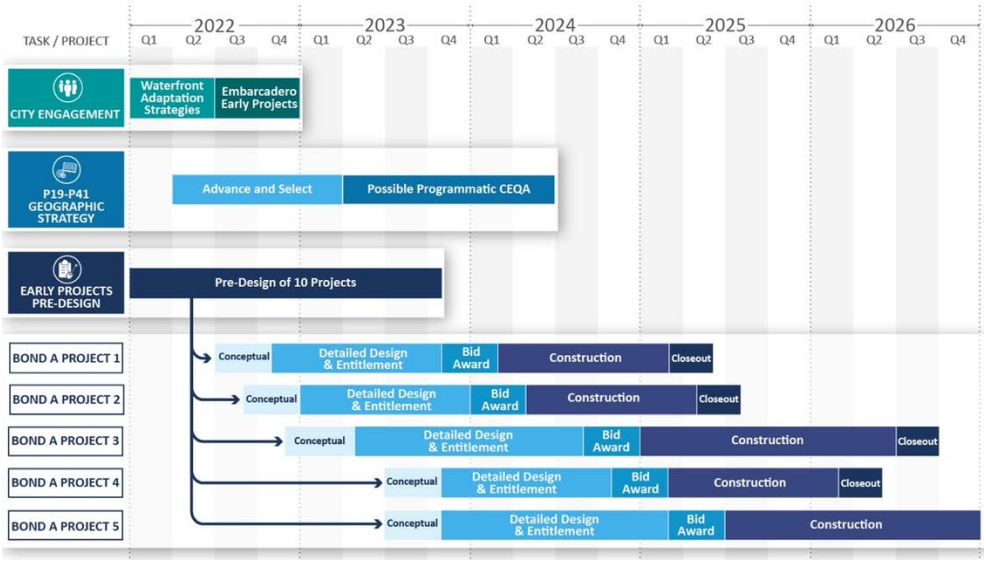
EMARCADERO EARLY PROJECT UPDATES

Since the last Port Commission update on December 14, 2021, the WRP Team has completed Needs Assessment Reports on six of the proposed Embarcadero Early Projects. Needs Assessment is the first step in our pre-design process and develops an aligned project vision, a broad range of initial project alternatives, and recommendations for Alternatives Analysis and selection of a preferred alternative. Brief project overviews and key findings from the Needs Assessment Reports are provided below.

Figure 2: Map of Embarcadero Early Projects

	1	Joint Operations Security Center and Fuel Dock Reliability Project
➡	2	Wharf J9 Replacement and Resilient Shoreline Project
	3	Taylor Street Seawall Earthquake Stabilization Project
	4	Pier 45 Apron Earthquake Safety Retrofit and Flood Risk Reduction
	5	Pier 43-1/2 Seawall and Wharf Earthquake Safety Project
	6	Pier 41 Seawall Earthquake Stabilization and Wharf Retrofit
	7	Pier 39 Seawall Earthquake Stabilization and Wharf Retrofit
	8	Pier 33 to 35 Seawall and Wharf Earthquake Reliability Project
	9	Pier 31-1/2 Bulkhead Wall and Wharf Earthquake Safety Retrofit
	10	Pier 27 Seawall and Wharf Earthquake Reliability Project
➡	11	Pier 15 Bulkhead Wall and Wharf Earthquake Safety Retrofit
➡	12	Pier 9 Bulkhead Wall and Wharf Earthquake Safety Retrofit
	13	Pier 9 Historic Shed Building Earthquake Safety Retrofit Project
	14	Pier 1 Bulkhead Wall and Wharf Earthquake Reliability Project
➡	15	Ferry Building Seawall & Substructure Earthquake Reliability
	16	Agriculture Building Bulkhead Wall and Wharf Earthquake Safety
	17	Pier 5 to Pier 22-1/2 Near-Term Coastal Flood Risk Reduction Project
➡	18	Pier 24 to Pier 28-1/2 Bulkhead Wall and Wharf Earthquake Safety
	19	EFWS, Intake Tunnel #1 Earthquake Reliability Project
	20	Giants Seals Plaza Seawall Earthquake Stabilization Project
	21	Pier Fire Suppression & Waterside Evacuation Improvements
	22	EFWS, Fireboat Manifold Earthquake Reliability Projects
	23	Pier Utility Connection Earthquake Retrofits at Seawall

Figure 3: Conceptual Schedule for Advancing Embarcadero Early Projects



Wharf J9 Replacement and Resilient Shoreline Project

Background

Wharf J9 forms the north edge of Sea Wall Lot (SWL) 302 and is part of the Fisherman's Wharf Lagoon at Pier 47 protected by a breakwater. The existing wharf consists of a timber bulkhead, which was built in 1919 for the working fishing industry with small vessel berths and public access at Fisherman's Wharf. The timber bulkhead wall and the piles are severely deteriorated and are currently closed for public safety and berthing is not operational. This early project focuses on replacing the failing Wharf J9 with a wharf built to modern seismic standards to contribute to a stable shoreline, and better connect the public to an updated working fishing industry.

The Embarcadero Seawall Multi-Hazard Risk Assessment (or MHRA) showed that the SWL 302 has high earthquake risk with lateral spreading. The east edge of the SWL, formed by Al Scoma Way, was found to have the highest earthquake risk due to instability of the shoreline. At the corner of Al Scoma Way and Jefferson Street, a portion of the Seawall is in poor condition because the Castagnola's Restaurant, constructed in the 1950's, was built over the Seawall and was not repaired along with the adjacent Seawall repairs in 1980. The initial project area was focused on Wharf J9, but the needs assessment area was expanded to consider Al Scoma Way and a portion of Jefferson Street based on the high earthquake hazard risk mentioned above.

Needs Assessment Findings

A series of "building blocks" or key alternative project approaches were developed to identify and analyze how different combinations would perform in addressing earthquake and sea level risks in this project area. The building blocks included two types of wharf structures, and the extent of scope to stabilize the shoreline (I.e. whether it is limited to Wharf J9 or whether it would continue along Al Scoma Way and a portion of Jefferson Street.

This work resulted in the development of five potential project concepts for further analysis. Three considerations remained constant in the concepts which are as follows:

- The elevation of the wharf was established to meet requirements for sea level rise for new construction.
- The berthing arrangement, found to be out of date for today's maritime needs, can be updated to accommodate modern boats, enhance off-the-boat fish sales commerce, provide increased disaster response needs for the area and provide an accessible path of travel to the boats.
- Lastly, the location of the Al Scoma bridge should remain in the same location and configuration.

Recommendations

The WRP team recommends progressing all five project concepts into Alternatives Analysis to further investigate the benefits of stabilization of the shoreline in this area of Fisherman's Wharf, the subsequent regrading of the wharf and Al Scoma Way in response to sea level rise, and the type of structure.

A holistic approach to the shoreline stabilization is an important factor for disaster response in the area so that continued access to the wharf would be possible after an earthquake. Investment in the area would revitalize an historically underinvested area and provide opportunities for enhanced public realm, access to the working fishing industry, and continuity of enjoyment to the water's edge in Fisherman's Wharf.

Pier 15 Bulkhead Wall and Wharf Substructure Earthquake Safety Retrofit Project

Background

Pier 15 is a rehabilitated and seismically strengthened historic finger pier that is home to the popular Exploratorium science museum as well as small and medium-sized vessel berths that can support earthquake response. Most of the pier and shed have low earthquake risk, however, Seawall earthquake risk is high, and movement of the Seawall may damage the bulkhead wharf compromising safety in the supported historic building and along the Promenade and adjacent open spaces. The Pier 15 Bulkhead Wall and Wharf Substructure Earthquake Safety Retrofit Project focuses on more easily implementable solutions to improve safety by retrofitting the wharf substructure and utilities to better accommodate earthquake movement of the Seawall. Current flood risk is lower here, and thick Bay Muds make improvements to stabilize the Seawall very challenging and costly. For these reasons, seismic stability improvements of the Seawall and improved coastal flood defenses will likely be part of the longer-term sea level rise adaptation strategy

Needs Assessment Findings

Needs Assessment confirmed the benefits of reducing seismic risk to the Pier 15 bulkhead wharf due to the popularity of the Exploratorium and the value of the extensive historic rehabilitation and seismic improvements already made to the Pier 15 facility. The process of developing project objectives and constraints also highlighted the strong desire to minimize the project's disruption to the Exploratorium by analyzing the existing structural improvements in detail to minimize the scope of potential retrofit work. In particular, while the existing seismic joint between the bulkhead and pier was not designed to accommodate the shoreline instability identified in the MHRA, it is still expected to benefit the seismic behavior of the wharf substructure.

Two retrofit concepts were developed, one of which will investigate the feasibility of under-deck upgrades to the wharf without altering the existing seismic joint through the wharf deck and the building above. This lower impact concept, if later determined to significantly reduce seismic risk, would likely be the preferred concept due to its minimal impact on Exploratorium operations

during construction. The second retrofit concept is a more comprehensive retrofit that includes enlarging the existing seismic joint. While this concept will achieve better earthquake performance, it will also significantly increase construction impacts.

Recommendations

The WRP team recommends progressing this project to Alternatives Analysis. During this phase, more detailed engineering analysis of the bulkhead wall and wharf structures will be performed to quantify the seismic performance and risk reduction benefits of the two seismic retrofit alternatives, and further develop the construction scope of each. The level of risk reduction combined with the costs of each alternative in both dollars and construction impacts will support the selection of the preferred alternative and the decision to progress the project further.

Pier 9 Bulkhead Wall and Wharf Substructure Earthquake Safety Retrofit Project

Background

Pier 9 is an historic finger pier housing diverse businesses and maritime offices including the San Francisco Bar Pilots and the Water Emergency Transportation Authority (WETA) both of which berth vessels at the Pier that are important for disaster response. The MHRA found high Seawall earthquake risk that may damage the bulkhead wharf compromising safety and limiting access to the Pier and along the Promenade. The Pier 9 Bulkhead Wall and Wharf Substructure Earthquake Safety Retrofit Project focuses on solutions to improve safety by improving the bulkhead building, wharf substructure and utilities to better accommodate earthquake movement of the Seawall. Current flood risk is lower here, and thick Bay Muds make improvements to stabilize the Seawall very challenging and costly. For these reasons, seismic stability of the Seawall and improved coastal flood defenses are expected to be part of the longer-term sea level rise adaptation strategy.

Needs Assessment Findings

Pier 9 is a historic structure that has not been seismically retrofitted. While the entire un-retrofitted facility is vulnerable to earthquakes, the MHRA found that the bulkhead area is the most vulnerable location due to combined effects of shaking and shoreline instability. Development of project objectives and constraints during needs assessment effort highlighted the need for seismic upgrades in the historic bulkhead building as part of any project alternative seeking to reduce risk in the bulkhead area of Pier 9.

All project alternatives include seismic upgrades to the bulkhead building but vary in the scheme proposed to retrofit the wharf and wall substructures. Substructure repair and retrofit options are proposed, with and without a seismic joint at the wharf-pier interface. Additionally, a concept to replace the existing substructure built with the wharf deck in place has been proposed. The substructure replacement option is challenging and expensive to construct but would have a longer life and could be designed for sea level rise adaptation. The Pier 9 bulkhead wharf is known to have significant substructure repair needs that would need to be addressed in repair and retrofit alternatives but could be partially bypassed with a substructure replacement option.

Recommendations

The WRP team recommends carrying retrofit and repair alternatives along with the substructure replacement option into the alternatives analysis phase. Both concepts will be progressed so that the fundamental decision on a retrofit and repair versus replacement can be made with confidence. It will also be important to progress the project's understanding and consideration of tenant impacts during the alternatives analysis phase, including more detailed estimation of temporary measures to minimize disruption to tenant access and utilities during construction.

Ferry Building Seawall and Substructure Earthquake Reliability Project

Background

The MHRA found the 125-year-old Ferry Building Seawall, building substructure, and surrounding piers at risk of damage in large earthquakes, jeopardizing emergency response, public safety, and the historic resource itself. Disaster response planners subsequently identified a need to rely on this area to receive inspectors, first responders, and return survivors to other parts of the Bay Area immediately following a major earthquake (Port and the San Francisco Department of Emergency Management Disaster Response Exercise with 115 participants representing 64 local, regional and national agencies).

Besides the earthquake risk, the MHRA also found the Ferry Building area to have the highest sea level rise risk on the Embarcadero. The Seawall has settled by as much as 2 feet in places since it was originally built exposing the Embarcadero, MUNI, and BART underground trains to flooding in an extreme event today.

Thick Bay muds and a complex mix of structures and infrastructure make this among the most complex areas of the waterfront to improve. Achieving earthquake reliability for staging disaster response will be difficult and may require a substantial investment.

Needs Assessment Findings

In Needs Assessment, the project vision was refined based on identification of problems and opportunities, and development of project objectives and constraints. The primary objectives include improving earthquake safety and providing reliable post-earthquake access for the ferry berths and staging areas to support disaster response and recovery. Secondary objectives include reducing risk of earthquake damage and loss of historic fabric, minimizing construction disruption, and fully considering long-term resilience.

Following development of the vision, a seismic measures toolkit was developed to address likely earthquake vulnerabilities identified in the MHRA. The toolkit includes targeted soil improvements under the Seawall to strengthen liquefiable sands, structural retrofits to tie the Ferry Building substructure and seawall together, structural retrofits of the surrounding access piers and plaza, and buttressing the area by stiffening the muds or adding super piles to reduce lateral spreading of the Seawall and the Embarcadero. The location of the Seawall is also being studied with options to move it to the perimeter and create a basement like structure under the Ferry Building that can help preserve the historic substructure, simplify post-earthquake inspections and repairs, and protect utilities from the Bay.

The WRP team combined seismic measures into a range of alternatives to provide complete solutions meeting different performance objectives. We evaluated the alternatives against performance objectives using engineering judgement. Due to the complexity of the area, advanced engineering analysis is strongly recommended to guide final decisions. Early indications are that it will be a challenge to balance the near-term need for more reliable earthquake disaster response and the long-term adaptation strategy for sea level rise and preservation. Additionally, work to improve the Seawall and substructure will likely require a cofferdam and dewatering under the entire Ferry building to provide construction access.

Recommendations

The Ferry Building area remains a high priority for potential early investment and the overall recommendation is to continue pre-design by completing an Alternatives Analysis Report. Specific recommendations include:

- Complete advanced engineering analysis as part of alternatives analysis to provide more certainty on earthquake behavior of various alternatives and long-term Adaptation Strategies.
- Inform Early Project alternatives by developing engineering concepts for the Adaptation Strategies along with Adaptation Pathways to better understand how an Early Project would contribute as an incremental step towards the larger adaptation effort.
- Coordinate with WETA and Golden Gate Ferry to advance master planning of the berths, queuing, and staging areas for the ferry system, both for daily operations and for disaster response.
- Coordinate with Hudson Pacific Properties to fully consider their operations, maintenance, repair, and capital improvement plans and priorities over the next 20 to 30 years.
- Coordinate with BART to consider their capital improvement plans as well as to share the earthquake improvement alternatives and construction methods under consideration along with assessment of potential impacts to the underlying tunnel and transition structure.

Pier 5 to 22½ Near-Term Coastal Flood Risk Reduction Project

Background

This is the most at-risk segment of the Embarcadero Seawall for sea level rise and regularly overtops during high and king tides today. If no action is taken before 2040, sea level rise is projected to cause regular shutdowns and flood damage. Tides and some storm events disrupt pedestrian, bicycle, and northbound traffic in low areas along the Embarcadero, the waterside promenade between Pier 3 and 5, cause flooding at the Agriculture Building, and creates water infiltration through the seismic joints on the north side of the Ferry Building apron when wave action is high. The nearby MUNI Portal, where trains enter the underground system, including BART, is located near the low-lying area of Pier 14 plaza which are at risk from coastal flooding in an extremely rare storm event. Saltwater is causing sections of the Promenade pavement and railings spanning between the Agriculture Building and the south edge of Pier 22½ to fail, and railings in other areas where regular overtopping occurs are demonstrating deterioration.

Needs Assessment Findings

The WRP team divided the span from Pier 5 to 22 ½ into three zones for more detailed assessment. The first is from Pier 1 through Pier 5, the second section is from Pier ½ to the south side of the Agriculture Building, and the third section spans from Pier 14 plaza to the south edge of Pier 22½. The WRP team developed three lines of potential flood defense, including the water's edge encircling the piers, a middle line just inboard of the water's edge, and a line along the curb, which were each studied along the geographic area. The WRP team established that the two lines of defense that are most desirable are along the water's edge and in the middle just inboard of the water's edge. The WRP team found that:

- In addition to coastal flooding from sea level rise, storm water management is a major risk as the water's edge is raised and coordination and alignment with the San Francisco Public Utilities Commission (SFPUC) is essential.
- Near-term flooding to approx. 2060 is a higher risk along the Agriculture Building, along Rincon Park to the south edge of Pier 22½.

- Historic and cultural resources need to be protected and the design needs to support continuity of businesses and the occupants of the buildings in the near-term.
- The public realm in the project area is an important part of the San Francisco waterfront and needs to be maintained.
- The costs for near term flood protection may be impacted by unknowns, such as near-term construction on existing substructure that may be in poor condition, and extent of storm water management infrastructure modifications needed.
- The WRP team needs to perform analysis to understand the balance of mitigating risks with costs and the useful life of the project, particularly in relation to the eventual adaptation pathway.

Recommendations

The WRP team recommends that two project approaches for the line of flood defense move into Alternatives Analysis, one at the water's edge and the other in the middle, just inboard of the water's edge. Further investigation of storm water flow and management is important to address annual flooding in the area. The nearby MUNI portal adjacent to Rincon Park is essential for continuity of Citywide transportation and may need to be protected with redundant, deployable or mechanical flood measures. Buildings on the National Register of Historic Places that are subject to periodic flooding need to be protected. Substructures under the Agriculture Building, the historic Fire House, and the Seawall along Rincon Park are in poor condition and further analysis is needed to establish feasibility of additional loads that would come with flood measures. This work can proceed concurrently with Alternatives Analysis.

Pier 24½ to Pier 28½ Bulkhead Wall and Wharf Substructure Earthquake Safety Project

Background

This Early Project proposes to reduce seismic risk to a 900-foot-long section of bulkhead wall and wharf supporting about half the width of the Embarcadero Promenade from Pier 24½ to Pier 28½. The MHRA determined the rock dike portion of the Seawall here to be more stable in earthquakes than other areas. However, there is very high earthquake risk to the tall bulkhead wall and wharves because of the way they are connected. The project would reduce seismic risk to the wharf-supported Promenade, a critical transportation and public realm asset for the Embarcadero and would protect egress and utility connections to the adjacent piers in the project area.

Needs Assessment Findings

The Needs Assessment process highlighted the undesirable seismic behavior of the bulkhead wall and wharf in this zone and the WRP team developed a suite of potential project alternatives to address these issues. The WRP team developed relatively simple seismic retrofit concepts, which would be paired with limited substructure repairs to the 110-year-old substructures. These repair and retrofit alternatives would be interim earthquake risk-reduction projects built to last until a more comprehensive shoreline adaptation project is constructed. The WRP team also developed concepts to provide new shoreline infrastructure with this early project, including a replacement wharf structure, or a new wharf combined with land-side measures behind the existing seawall to stabilize the shoreline and brace the old seawall. Under this approach, new shoreline infrastructure would be long-lived and would incorporate design features allowing for future adaptation to rising sea levels.

Recommendations

The WRP team recommends progressing the Pier 24½ to Pier 28½ Bulkhead Wall and Wharf Substructure Earthquake Safety Project to Alternative Analysis to determine and further develop the preferred alternative from the suite of concepts developed in the Needs Assessment Report.

Specific investigations and studies that will provide key input into the decision on the preferred alternative include:

- Perform additional engineering analysis to build on MHRA findings and better understand the combined behavior of the soils, concrete seawall, wharf, and piers in this zone.
- Detailed field inspection to determine condition of the 110-year old wharf deck, as well as determine the condition and location of under-deck utilities impacted by the project. The scope of substructure repair will be a major consideration on the decision to proceed with a repair + retrofit alternative or to replace the wharf and reinforce the bulkhead wall with new infrastructure.
- Coordinate with the Port's public-private development projects at Piers 30-32 and Piers 38 and 40 to better understand the potential for a continuous resilient shoreline delivered via the shoreline stabilization alternative in this project and the two development projects.

EARLY PROJECT DECISION-MAKING

This report to the Port Commission is a regular update to the Port Commission about our progress with Embarcadero Early projects. The WRP team is not seeking additional direction at this time; feedback from the Port Commission which we received in December 2021 is still guiding the team.

As we advance Embarcadero Early Projects through predesign, we will require decisions from both the Port Executive Director and the Port Commission. In December 2021, the WRP team identified 23 Embarcadero Early Projects with a projected cost range of $650 Million to $3 Billion, far in excess of available funding. This means that we will have to seek direction regarding the smaller set of projects that will be funded with Proposition A.

For context to this decision-making, it is important to note that the 23 Embarcadero Early Projects are very different in scale and complexity, with different schedules. Some projects, like those in the Pier 19 to 41 Geographic Strategy, require the Port and the City to select a preferred plan for the USACE San Francisco Waterfront Coastal Flood Study, expected next April 2023. Other projects can move much more quickly into construction, including some that will start construction in 2024.

The WRP expects to approach the Port Commission with the following types of decisions as we progress:

- **Early Wins:** A number of simpler, cost-effective projects can reduce earthquake and flood risk at a relatively low cost. Some are described in this staff report (e.g., the Pier 15 Bulkhead Wall and Wharf Substructure Earthquake Safety Retrofit Project). After completing conceptual design, at which point the WRP team will develop a scope, schedule and budget for each project, the team will recommend advancing one or more Early Wins to detailed design and construction in 2023, with a goal of shovels in the ground by 2024. To facilitate decision-making, the WRP team will provide as background the status of other Embarcadero Early Projects.

- **Resources:** The WRP team advancing Embarcadero Early Projects currently has a Deputy Program Manager – Engineering and Project Delivery and 3 project managers. There is also a specified budget in the CH2M Hill Planning, Engineering and Environmental contract for project design activities. If there is a desire to advance more projects simultaneously, the WRP team will recommend additional staffing and contracts to allow this.

- **Detailed Design and Construction:** When projects are ready to move into detailed design and construction, after scope, schedule and budget has been determined, the WRP team will approach the Port Commission with a request for authorization to proceed.

- **Grant Awards:** The WRP team is always looking for grant opportunities to advance Early Projects, to further leverage Proposition A bond funding. If the WRP team obtains grant funding towards this Early Project effort, the team will return to the Port Commission to seek approval of grant awards.

NEXT STEPS

The WRP is making good progress on advancing pre-design of the Embarcadero Early Projects. Six projects have completed the Needs Assessment step of pre-design and are now moving to Alternatives Analysis. Recommendations to advance the first projects into detailed design are expected in 2023 and construction is expected to start before the end of 2024. Staff will continue to update the Commission regularly on progress and alert the commission to any potential changes in strategy as projects advance.

Prepared by: Steven Reel, Deputy Waterfront Resilience Program Manager – Engineering and Project Delivery

Brad Benson, Waterfront Resilience Director