Early Project Cost Estimates

Financial District and Seaport Climate Resilience Master Plan

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1. Overview & Objectives

This appendix supplements the Financial District and Seaport Climate Resilience Master Plan – Chapter 6: Funding and Financing. This appendix expands upon the "What Drives the Costs of the Master Plan?" call-out box on page 170.

Implementing this master plan requires construction of large, new infrastructure systems in locations that are challenging for construction. The costs are primarily driven by the core infrastructure needed to construct the flood defense system, including clean fill and structural elements such as caissons, floodwalls, and floodgates. New drainage infrastructure will also be needed, including a pump station, additional sewer pipes and green infrastructure. Another major cost driver is the partial or full reconstruction of multiple maritime facilities across the shoreline to ensure their resiliency and provide integrated flood protection to complete the line of defense while maintaining maritime access and uses. Also considered are pile-supported and waterfront structures, roadway improvements, and miscellaneous site modifications related to those items.

The Project Team estimated capital costs using a combination of approaches based on precedents from around the region. For some project elements, such as a new ferry terminal, where the size and design are less certain, the estimates were more approximate than for other elements, such as pier reconstruction, where more detailed cost per square foot estimates were used. While it will be expensive to implement the master plan, the cost of doing nothing is far greater.

By nature of the early stage of design, these estimates are high-level and are intended to present an understanding of the cost implications of different project features to inform further refinement in future phases of the project. The estimates are between AACE Class 5 (Concept Screening) and Class 4 (Study or Feasibility). Class 5 has a typical accuracy range of 20% to 50% lower and 30% to 100% higher, and Class 4 has a typical accuracy range of 15% to 30% lower and 20% to 50% higher. All costs are presented in 2021 US dollars.

2. Data Sources

To select appropriate unit costs, the Project Team examined recently-bid, similar projects such as East Side Coastal Resiliency; referenced published or industry accepted unit costs or costs for similar project elements; estimated costs as a percentage of construction; or used engineering judgement and experience, if needed. Contractor markups and other soft costs are based on generally accepted industry practice or derived from recently-bid, similar projects such as East Side Coastal Resiliency.

3. Approach

A dynamic cost model, which the Project Team continually updated as the design evolved, served as the main tool for developing cost estimates for both the capital and operations and maintenance (O&M) costs.

The Project Team followed the steps outlined below to create the cost model:

1. **Define unit costs:** For each item that was used in the cost modeling process, such as pile-supported piers or flood gates, the Project Team defined a unit cost. Unit costs for each item were given in square feet, linear feet, acres, and, in some cases, lump sum estimates. By defining unit costs at the beginning of the process, the Project Team ensured that each time the model used an item, the item was given the same cost.
2. **Define element costs:** The Project Team built each element from the unit costs. For example, to calculate the element cost of a forty-foot-long flood gate, the team multiplied the per linear foot unit cost for flood gates by forty. By defining element costs, the Project Team ensured that each time the model used an element, it was given the same cost.
3. **Assign elements to project components:** Grouping elements by their purpose or location allowed the Project Team to understand how costs might be grouped and which costs must be incurred together.
4. **Incorporate allowances**: The Project Team layered allowances onto project costs. Some costs were included as allowances because there was insufficient detail to estimate the costs more precisely. The Project Team also utilized standard construction allowances. Additional detail and a list of which items were included in each type of allowance is available in the assumptions section below.
5. **Incorporate project phasing:** The Project Team incorporated project phasing to allow for the estimated impact of inflation to be incorporated into the costs through escalation and to provide a more thorough picture of O&M costs.
6. **Incorporate an estimation of O&M costs**. The Project Team considered the following when developing O&M cost estimates:
    a. Total O&M costs in a given year, based on the cumulative capital expenditures (excluding demolition and estimated costs for expected mitigation for impacts to aquatic habitats) to that date.
    b. Some O&M costs were included annually, while others were included on a cyclical basis, such as every five years or every twenty years. Minor maintenance costs are accrued every year, such as inspection, exercising, cleaning, lubrication, surface renewal and graffiti removal. Major maintenance costs, where less frequent maintenance is required, are accrued every five, ten, or twenty years and include replacing joint sealant and aligning hinges, recoating, recertification, and as-needed repairs. The Project Team used a cadence for O&M costs derived from precedent projects.
    c. O&M costs increase over time to account for the age of the infrastructure. This means the O&M costs are relatively cheaper when the infrastructure is newer compared to when it is older; this factor is in addition to the cyclical nature of costs.
    d. There are O&M costs that exist today in relation to elements of the current waterfront in the study area, for example, maintenance of the esplanade. Therefore, O&M costs that already exist were considered separately from new O&M costs to understand the expected net increase in O&M costs because of this project.

4. Assumptions

To prepare an estimate for a conceptual level of design, the Project Team made multiple necessary assumptions, including those noted below.

- **Mitigation costs for newly created wetlands**. The Project Team made assumptions, based on recent projects, about the size and cost of wetlands that would need to be newly created to compensate for every acre of new fill or shading. The actual required size of the new wetlands will be determined by the regulatory agencies during environmental review.
- **Timeline for construction.** The Project Team assumed that construction of the project would be completed in 2040.
- **Escalation**. The Project Team assumed escalation, to allow for the effects of inflation, to be 3% per year.
- **O&M**. The Project Team assumed O&M costs to be an average of about 1% of capital costs incurred through the year in question.
- **Costs included as allowances**. The Project Team included some costs as allowances because it did not have sufficient detail to estimate them more precisely. These costs included general demolition, utilities, site/civil work, site drainage, maintenance and protection of traffic (MPT), and landscaping and urban design elements.
- **Costs estimated as unit costs and quantities**. Some costs were estimated using unit costs and quantities. These costs include but are not limited to: flood wall, structural fill, piers, pile supported shoreline platform, roadway gates, pedestrian gates, upper level esplanade, and sheet pile bulkhead.
- **Construction allowances**. The Project Team included standard construction allowances, such as for mobilization/demobilization, general conditions, contractor overhead and profit, insurance and bonding, contingency, and soft costs.
- **Buildings**. The costs do not include any revenue-driven new buildings, but do include the costs of amenity buildings, such as the pump station, and ferry terminal buildings, as well as their O&M costs.
- **Contingency.** Based on the early design phase of the project, the costs include a 50% design and construction contingency.
- **Material availability and market volatility**. The costs may change based on material availability and market volatility. The costs are expected to change and should be updated as the design and timeline advances.

5. Results and Key Findings

Based on the process described above, the total estimated capital costs to realize the master plan range from $5.2B to $7.2B. The range arises from whether the estimated impact of inflation during construction is included. The net increase in average annual O&M costs is anticipated to be approximately $30M (in 2021 dollars). A high-level breakdown of the approximately $5.2B capital cost (in 2021 dollars) is below[1].

- The flood protection base (i.e., the caisson and fill to raise the shoreline to +11 feet NAVD88, including tie-ins) is expected to cost approximately $1.1 billion.
- The floodwall and gates to realize the design flood elevation of +23 feet NAVD88 are expected to cost approximately $1.0 billion.
- Reconstructing the Whitehall Ferry Terminal, the Battery Maritime Building, and the proposed new Governor's Island Ferry Terminal is anticipated to cost approximately $2.0 billion.

[1] Costs may not add to $5.2B due to rounding and significant figures.

- Stormwater management infrastructure (i.e., a pump station and additional conveyance to bring water to the pump station) is expected to cost approximately $700 million.
- Pier 6, which services the heliport, and Pier 11, which services the city ferry, are expected to cost approximately $200 million to reconstruct.
- Piers 15 and 16, which can be completed after the other project components, are expected to cost approximately $100 million to reconstruct.
- Mitigation, which needs to be in place prior to construction, is estimated to cost approximately $100 million.

While the master plan does not include a specific proposal to remove the FDR Drive Viaduct, it was important to ensure the compatibility of the master plan with potential alterations to the roadway, given the master plan's long time horizon The Project Team conducted a high-level analysis of many possible ways that the roadway could be reconfigured to ensure that the flood defense will not limit the City's options for the viaduct. If the City seeks to remove the viaduct structure in the future, the Project Team determined that replacing the viaduct and South Street in the project area with a multi-modal, at-grade boulevard would be the best solution to balance cost, engineering, traffic, and pedestrian experience considerations. Removing the FDR Drive Viaduct and replacing it with an at-grade boulevard would cost approximately $2-3 billion in 2021 dollars.