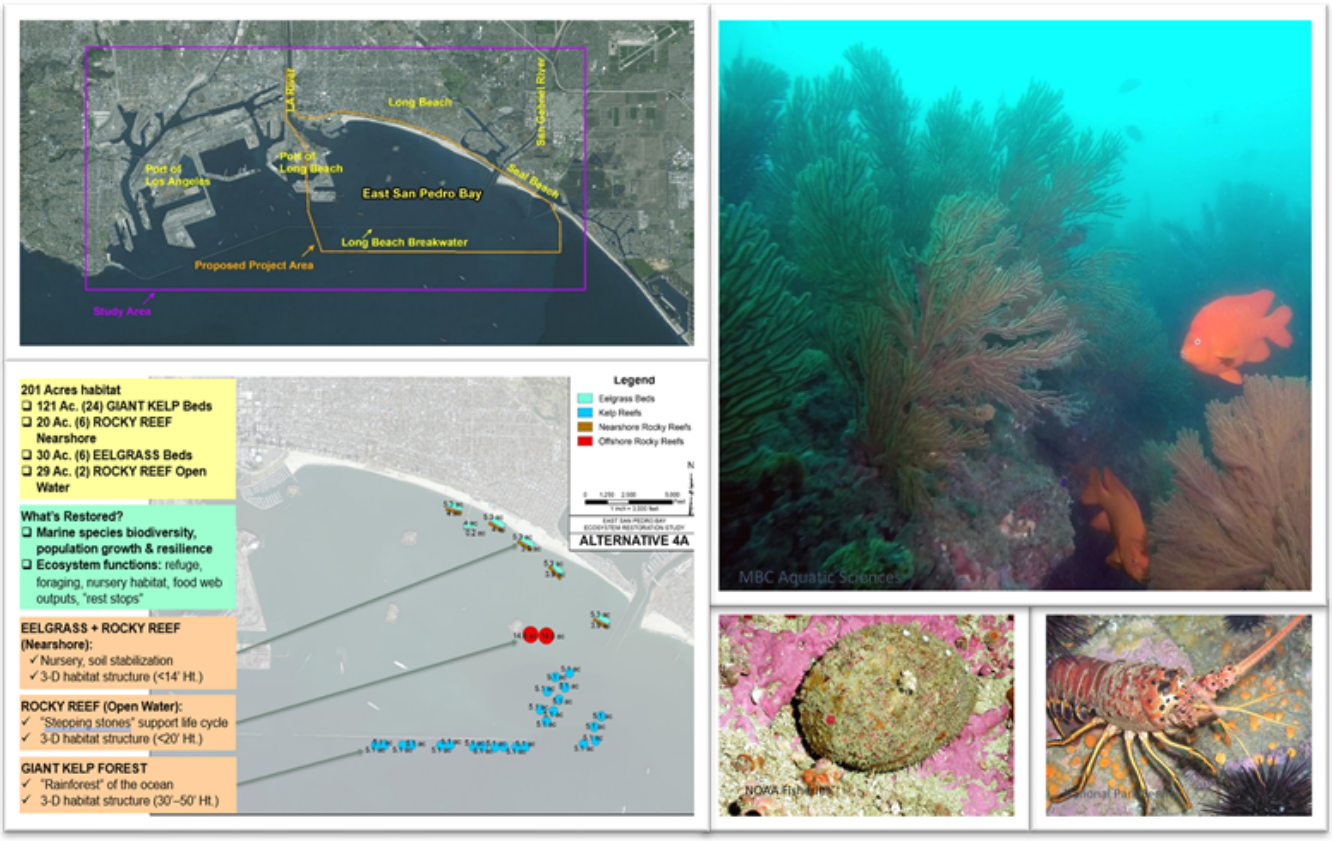
FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL IMPACT REPORT (EIS/EIR)

APPENDIX B: COST ENGINEERING

EAST SAN PEDRO BAY
ECOSYSTEM RESTORATION STUDY
Long Beach, California

January 2022



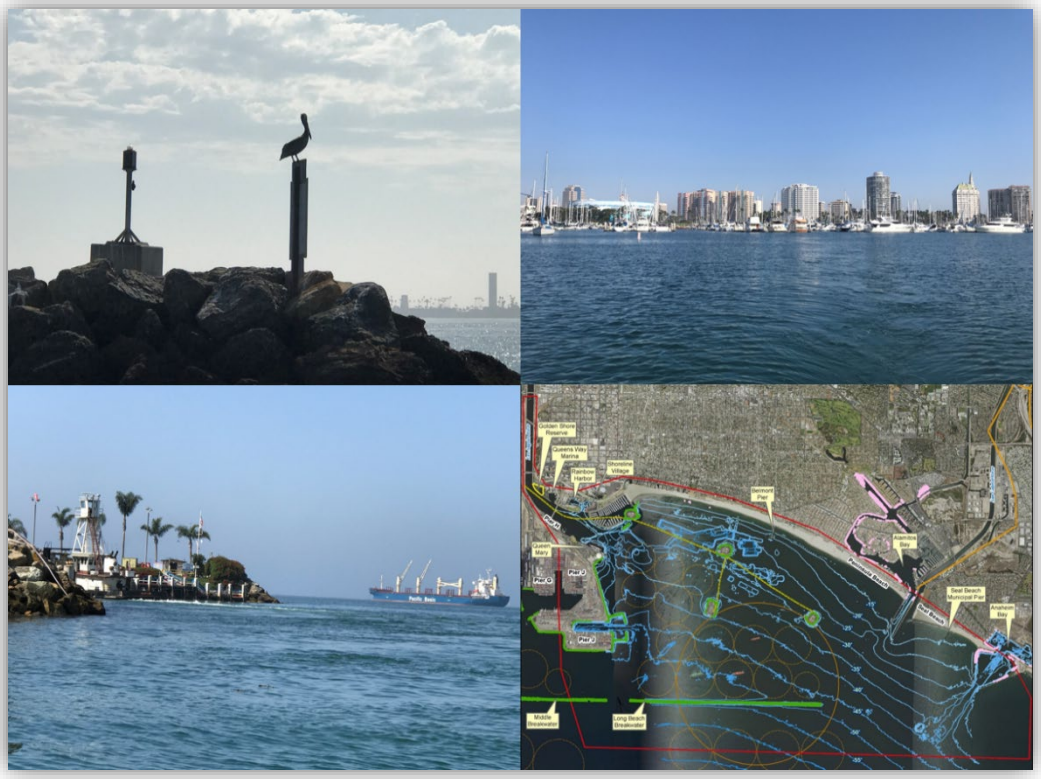
US Army Corps of Engineers ®

TABLE OF CONTENTS

EAST SAN PEDRO ECOSYSTEM RESTORATION FEASIBILITY STUDY

City of Long Beach, California

Cost Estimate



U.S. Army Corps of Engineers
Los Angeles District

October 2021

Section **Page**

List of Figures

1 Overview

This paper discusses the cost assumptions and construction methodology utilized in the East San Pedro Bay Ecosystem Restoration Feasibility Study (NER).

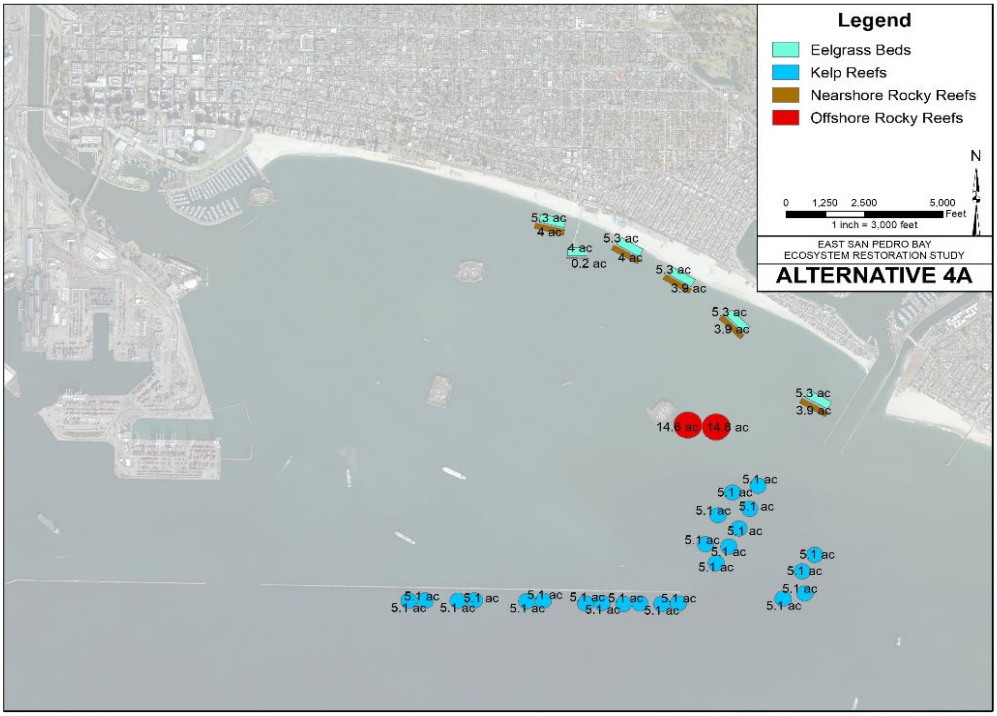
Project purpose is to restore the complex aquatic ecosystem that was historically present within East San Pedro Bay (ESPB) region, but has been degraded by port construction, river channelization, construction of the Middle and Long Beach federal breakwaters, and other contributors to current conditions.

The USACE identified Alternative 4A (Reef Restoration Plan) as the National Ecosystem Restoration (NER) Plan and the TSP. Restoration features include 24 rocky reefs intended to support kelp beds (121 acres) along the breakwater and in open water, two open water rocky reefs (29 acres) by Island Chaffee, and six nearshore rocky reef shoals (20 acres) coupled with six eelgrass beds (30 acres). In total, this alternative intends to restore over 200 acres of rocky reef, eelgrass, and kelp habitat.

The design for submerged reefs involves providing sufficient voids to provide refuges for smaller fishes as well as substrate for different forms of algae and invertebrates. Creation of the rocky reef habitat will be accomplished with stone mined from Catalina Quarry (a.k.a. Pebbly Beach). The purpose of these reefs, aside from providing primary habitat benefits from the structure itself, is to provide for adequate eelgrass habitat.

The project is broken down into seven (7) contracts. Contracts #1 and #7 consists on creating a rocky reef kelp habitat alongside the Long Beach Breakwater. Contracts #2 and # 3 consist on establishing an eelgrass habitat by building a rocky shoal nearshore. Contract #4 supplements Contract #2 and Contract #3 nearshore rocky shoal by importing sand from a designated borrow site to support growth and expansion of eelgrass. Contracts #5 and #6 consist on building rocky reefs in the center of the open water zone.

Project site is located within the San Pedro Bay in the City of Long Beach, California.



The Micro-Computer Aided Cost Estimating System (MCACES), Second Generation (MII) program was used to develop costs for all construction contracts.

The Cost Engineering Dredge Estimating Program (CEDEP) program was used to compute hopper dredging unit costs for sand placement in Contract #4. The dredging unit cost was transferred to the Micro-Computer Aided Cost Engineering System, Second Generation (Mii) software program. Current Working Estimate (CWE) meets the Standard USACE Civil Works Work Breakdown Structure (WBS).

2 Direct Cost

For Contracts #1 and #7, costs for stone placement in windrows on the sea floor for kelp reef construction, mob/demob, surveys, and marine mammal monitoring during construction were calculated in MCACES (MII).

For Contracts #2 and #3, costs for armor stone, filter stone, and core stone placement of the rocky reef shoals, including mob/demob, eelgrass survey and marine mammal monitoring during construction were calculated in MCACES (MII).

For Contracts #5 and #6, costs for armor stone placement for the rocky reef shoals, mob/demob, surveys, and marine mammal monitoring during construction were calculated in MCACES (MII).

For Contract #4. Costs for mob/demob and sand placement operations were calculated using the Clamshell Dredge CEDEP program. Unit costs for the clamshell dredge and mob/demob were integrated in MCACES (MII). Costs for eelgrass transplant, including surveys, were calculated in MCACES (MII).

Adaptive Management and Environmental Monitoring costs were provided by Environmental Resources Branch (ERB). The Monitoring and Adaptive Management Plan (MAMP) is carried over 10 years after construction of each contract.

Labor rates used to develop the estimate were provided from latest Davis-Bacon Wage Rates for Los Angeles County, Heavy and Dredging.

Equipment rates are based on the US Army Corps of Engineers EP 1110-1-8 "Construction Equipment Ownership and Expense Schedule", Region 7 and CEDEP.

Crews were developed for project specific application and are listed in the crew database.

3 Quantities and Material Analysis

Stone volumes and areas were supplied by Coastal Engineering. Tonnage for the rocky reefs and kelp reefs were obtained through CAD software using the difference between two Triangulated Irregular Network (TIN) surfaces: the existing seafloor elevations and the proposed reefs.

Quarry stone would be sourced and transported from the Catalina Quarry (a.k.a. Pebbly Beach Quarry). The quarried stone will remain stockpiled on the transportation barges until ready to use for construction. Existing mooring locations within the Port of Long Beach will be utilized. An additional Staging and Storage area will be used for equipment and other material staging and storage, as well as, a departure point for the Contractor.

3.1 Contract #1 - Near Long Beach Breakwater - Kelp Reefs.

Contract consists on placing scattered 500 lbs rocks at 12 locations or modules. The profile of the reef is a single rock layer rising no more than 1.5 feet off the existing sand seafloor. Contract allows lead time for the quarry to fabricate the stone ahead of time.

3.2 Contract #2 - Nearshore - Rocky Reefs.

Contract involves strategically placing armor, core, and filter stones at 3 locations or modules nearshore. Armor stone average weight is 7-tons. Core stone average weight is 1-ton. Filter stone average weight is ¼-ton. The creation of the habitat type consists on building a rocky shoal to decrease velocities caused by wave motion. The rock shoal would be created by first dumping stone in a random manner then finely place the cap material to obtain sufficient interlocking and depth. Contract allows lead time for the quarry to fabricate the stone ahead of time.

3.3 Contract #3 - Nearshore - Rocky Reefs.

Contract #2 and #3 are identical. The rocky reef work was divided into Contract #2 and Contract #3 to allow sufficient time to produce and process required stone tonnage. Multiple contracts allow normal operations and prevent extra-ordinary efforts and expedited schedules at the quarry, ultimately mitigating costs.

3.4 Contract #4 - Nearshore - Eelgrass Beds.

Contract consists on building eelgrass beds to functions as habitat and nursery areas for marine life at 6 locations or modules. Contract #4 consist of two construction activities: sand placement and eelgrass transplant. Sand will be obtained from the Surfside/Sunset borrow area and placed in the lee of the nearshore reefs. The Surfside/Sunset borrow area is situated approximately 4.5 miles from the placement

site. The estimated dredge volume is based on the placement or receiver site required volume, instead of the actual dredged volume. Therefore, overdepth yardage is not a factor. Volume was approximately calculated by multiplying a footprint area of 12.5 acres by 5 feet of depth. 100,000 CY of sand is distributed evenly throughout all 6 locations or modules. Eelgrass is harvested and transplanted from around the eelgrass habitat on the project site.

3.5 Contract #5 - Open Water - Rocky Reef.

Contract involves strategically placing 10-Ton armor stones at 1 location.

3.6 Contract #6 - Open Water - Rocky Reef.

Contract #5 and #6 are identical. The rocky reef work was divided into Contract #5 and Contract #6 to allow sufficient time to produce and process required stone tonnage. Multiple contracts allow normal operations and prevent extra-ordinary efforts and expedited schedules at the quarry, ultimately mitigating costs.

3.7 Contract #7 – Open Water - Kelp Reefs

Contract #7 is identical to Contract #1, but in an open water reef complex, instead of next to the breakwater. Contract #7 consists on placing scattered 500-lbs rocks at 12 locations or modules. The profile of the reef is a single rock layer rising no more than 1.5 feet off the existing sand seafloor. Contract allows lead time for the quarry to fabricate the stone ahead of time.

4 Equipment Selection

Equipment selection and sizing were developed through construction cost estimator experience and consultation with the designer and study manager.

For the rocky reef and kelp contracts, the 300-ton barge-mounted Long Beach (DBLB) operated by Connelly Pacific with supporting crews was selected to handle the large stone placement and a CAT 973 track-loader on top of the supply-barge is selected to push off the smaller stone.

For the eelgrass beds, up to 100,000 cubic yards of dredged sand material obtained from the Surfside/Sunset borrow area would be dumped on the leeward side of the five nearshore rocky reefs with the use of two split-haul scow. A clamshell dredge is selected for all dredging because this type of equipment has been determined to be well suited based on the quantity and the location of the work. Dredging is expected to occur on a 24-hour per day basis. The USACE will attempt to sequence dredging activities during winter months (November – March 31).

5 Construction Methodology

5.1 Kelp Reefs (Contracts #1, #7)

Kelp Reefs (Contracts #1, #7) construction consists on initially positioning a 300-ton derrick barge by tugboat above the designated dumping area. Six motorized winch anchor lines moor the derrick barge within the boundary. During boulder deposition, the derrick barge is guided into the designated position by winching in or out on anchor cables connected to their respective anchors. Each anchor is connected by a braided steel cable to a 15-ton concrete anchor block, which is connected to a surge-can (foam-filled) and then cabled to the derrick barge. The locations of the anchors are routinely monitored by an attending tugboat and by the derrick barge winch operator. After securely tethering the supply-barge to the derrick

barge, the derrick barge winch operator maneuvers the edge of the flat deck barge to the required position. The derrick barge winch operator assists in locating the edge of the supply barge at the exact line of deployment. The stone is pushed-off in windrows with a CAT 973 track loader from the top of the supply barge. Rocks must be placed in designated polygons and cast upon the seafloor within the described boundaries of each polygon in a single layer. Stones exact placement is not required.
Stone is allowed to be placed during day light hours, only. No placement is done at night, except for hauling.

5.2 Nearshore Rocky Reefs (Contracts #2, #3)

The rocky reef will be created by first dumping core stone (1/4-ton average), followed by placing the filter stone (1-ton average), and capped with armor stone (7-ton average). Core stone will be dumped or pushed off the work barge by a CAT 973 track loader from the top of the supply barge. The barge derrick would be utilized to shape the core stone once it is dumped. The derrick also helps stabilize the supply-barge. Unlike the smaller core stone, direct dumping of the large filter stone is not usually an acceptable placement process. Filter stone will be placed with the 300-ton barge mounted derrick using a skiff bucket. The skiff bucket is loaded with a CAT973 track loader, the buckets is picked up by the derrick, swung, lowered, material is dumped, the bucket is raised, and re-loaded. Last, armor stone will be individually placed with the 300-ton derrick to obtain sufficient interlocking.

Construction schedule consists of 12-hour shifts, 6 days per week. Given on-site travel time, breaks, and lunch, actual working time is 10 hours per day.
Stone would be obtained from the Pebble Beach Quarry on Catalina Island. Nearly all coastal projects in Southern California utilize this rock source since it can be barged to the site and avoid trucking and double handling.

5.3 Open-water Rocky Reefs (Contracts #5, #6)

Open-water Rocky Reefs (Contracts #5, #6) construction consists on individually placing 10-ton armor stone. Armor Stone will be individually placed with the 300-ton derrick barge to obtain sufficient interlocking. Construction schedule consists of 12-hour shifts, 6 days per week. Given on-site travel time, breaks, and lunch, actual working time is 10 hours per day. Stone would be obtained from the Pebble Beach Quarry on Catalina Island. Nearly all coastal projects in Southern California utilize this rock source since it can be barged to the site and avoid trucking and double handling.

5.4 Nearshore Eelgrass Beds (Contract #4)

Nearshore Eelgrass Beds (Contract #4) construction consists on establishing an eelgrass habitat by bringing in sand from a designated borrow site to create a bench to support growth and expansion of eelgrass. Six (6) nearshore eelgrass habitat restoration locations or modules will be created. The desired outcome is to increase the extent (acreage) of eelgrass within the nearshore zone.
Cost consists on initially creating a nearshore sand reef by importing sand from the Surfside/Sunset Borrow area situated approximately 4.5 miles one-way. For cost estimating purposes and environmental consideration, 100,000 yd^3 of beach quality sand and placed in the lee of the nearshore reefs. The required sand will be dredged from the Surfside/Sunset borrow area and dumped by a scow in as shallow as possible nearshore depths of 10-15 ft (MLLW). It is assumed that dredging at the borrow area would occur 24 hours a day and 7 days a week with two scows allowing the placement of 4,000 yd^3 per day. Natural processes will re-distribute the sediment along the profile, allowing the perched shoreline to be held in place by the nearshore reefs. Then, eelgrass is harvested from around the eelgrass habitat on the project site. Eelgrass transplant will take place in relatively shallow waters. A pre-survey of the area will determine the density. Transplant procedure occurs within the same day with harvesting and planting

occurring concurrently. Divers harvest the plants, hand them over to the shore or work barge crew for planting preparation, then the plants are handed back to the divers for planting. Divers lay-out a grid system before planting starts. Work schedule Construction schedule consists of 10-hour shifts, 5 days per week. Factors such as distance between donor and transplant sites, available crew, experience of crew, requirements for divers and vessels, and insurance can affect prices.

6 Mobilization and Demobilization

For the rocky reef, costs include the initial mobilization of the derrick barge, tug, and support vessels for the placement of the core, filter, and armor stone, as well as intra-site mob/demob between the rocky reef sites. The derrick barge mobilization and demobilization cost was based on: derrick setup; 24 hours to transfer to the work site; 24 hours to transfer from the work site; crane disassemble/prepare for storage; test crane; allowance for tugs, loaders, and miscellaneous equipment mob/demob; relocate personnel to jobsite; relocation of derrick and marine crew within project boundaries; furnish boat access; air quality permits; and as-builts.

For the kelp reef, costs include the initial mobilization of the derrick barge, tug, and support-vessels for the placement of the ¼-ton stone, as well as intra-site mob/demob between the kelp reef sites. The 300-ton derrick stabilizes the work barge carrying the ¼ ton stones and using motorized winch anchor lines to relocate the derrick barge within the boundary. The derrick barge mobilization and demobilization cost was based on: derrick setup; 24 hours to transfer to the work site; 24 hours to transfer from the work site; crane disassemble/prepare for storage; test crane; allowance for tugs, loaders, and miscellaneous equipment mob/demob; relocate personnel to jobsite; relocation of derrick and marine crew within project boundaries; furnish boat access; air quality permits; and as-builts.

For the eelgrass beds sand placement, there are prospective bidders from San Diego and Long Beach. For the clamshell dredge, 300 miles plant transfer was assumed for mobilization and demobilization to err on the side of caution.

7 Construction Schedule

The total construction duration for each contract varies depending on the complexity and size of the contract. A land-based staging and storage area is required for contractor's use including access to the water. A location near Pier T within the Port of Long Beach has been tentatively identified with adequate area and water access. Work involving a dredge can be conducted 24 hours a day, 7 days a week. Work involving stone placement is limited to daylight hours. Due to the location of the staging area well within the commercial port complex, no access limitations are expected.

Estimate contract durations:

1.	Kelp Reef next to the breakwater:	6 months	Contract #1
2.	Kelp Reef, open water:	6 months	Contract #7
3.	Rocky Reef, nearshore:	24 months	Contract #2
4.	Rocky Reef, nearshore:	24 months	Contract #3
5.	Rocky Reef, open water:	18 months	Contract #5
6.	Rocky Reef, open water:	18 months	Contract #6
7.	Eelgrass Beds:	6 months	Contract #4

8 Monitoring and Adaptive Management (MAMP) Costs

Construction contracts account for wildlife monitoring and eelgrass surveys as required. When dredging and nearshore placement operations occur, a qualified biologist will be on site to monitor for the presence of green sea turtles and marine mammals. Monitoring and Adaptive Management costs include kelp surveys; eelgrass surveys; rocky reef surveys; and kelp and eelgrass post-construction transplantation if success criteria are not met.

9 Acquisition Strategy and Sub-contracting

Current Working Estimates (CWE) are based on performing the work using the "Invitation for Bid" contract mechanism.
All stone placement and dredging work will be performed by a marine prime contractor. Eelgrass transplants and surveys will be subcontracted.

10 Planning, Engineering and Design (PED) and Construction Management

Planning, Engineering and Design (PED) and Construction Management estimates were based on labor-hour estimates provided by section chiefs. Associated burdened hourly rates were extracted from CEFMS.

11 Contingency

Contingency was derived from the Cost and Schedule Risk Analysis (CSRA). Please refer to the risk analysis study.

12 Escalation

Construction Escalation is based on the Civil Works Construction Cost Index System (CWCCIS).

PED and Construction Management Escalation is based on EC 11-2-XXX Table 1, Class 1 (Government Personnel).

Real Estate escalation is based on the Construction Price Yearly Index (CPI).

Estimate was inflated to mid-point of construction for the initial and subsequent nourishment events.

Please refer to the Total Project Cost Summary (TPCS) for breakdown.

US Army Corps
of Engineers®

East San Pedro Bay Ecosystem Restoration

Project Cost and Schedule Risk Analysis Report

Prepared for:

U.S. Army Corps of Engineers,
Los Angeles District

Prepared by:

U.S. Army Corps of Engineers
Cost Engineering, Los Angeles District

October 15, 2021

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

EXECUTIVE SUMMARY

The US Army Corps of Engineers (USACE), Los Angeles District, presents this cost and schedule risk analysis (CSRA) report regarding the risk findings and recommended contingencies for the East San Pedro Bay Ecosystem Restoration project. In compliance with Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated September 15, 2008, a *Monte-Carlo* based risk analysis was conducted by the Project Development Team (PDT) on remaining costs. The purpose of this risk analysis study is to present the cost and schedule risks considered, those determined and respective project contingencies at a recommended 80% confidence level of successful execution to project completion.

Restoration features include 24 rocky reefs intended to support kelp beds (121 acres) along the breakwater and in open water, two open water rocky reefs (29 acres) by Island Chaffee, and six nearshore rocky reef shoals (20 acres) coupled with six eelgrass beds (30 acres). In total, this alternative intends to restore over 200 acres of rocky reef, eelgrass, and kelp habitat

The current project base cost for the East San Pedro Bay Ecosystem Restoration Project estimate is approximately $179.0M excluding real estate costs, contingency, and expressed in FY 2021 dollars. This CSRA study included all estimated construction costs, Planning, Engineering, Design and Construction Management costs. Based on the results of the analysis, Cost Engineering recommends a contingency value of $73.5M or approximately 41% of base project cost at an 80% confidence level of successful execution.

Cost estimates fluctuate over time. During this period of study, minor cost fluctuations can and have occurred. For this reason, contingency reporting is based in cost and per cent values. Should cost vary to a slight degree with similar scope and risks, contingency percent values will be reported, cost values rounded.

Table ES-1. Construction Contingency Results

Base Case Construction Cost Estimate	**$179,224,000**		
Confidence Level	**Construction Value ($$) w/ Contingencies**	**Contingency (%)**	**Contingency $**
50%	$240,160,160	34%	$60,936,160
80%	**$252,705,840**	**41%**	**$73,481,840**
90%	$259,874,800	45%	$80,650,800

KEY FINDINGS/OBSERVATIONS/ASSUMPTIONS & RECOMMENDATIONS

The PDT worked through the risk register in June 2021. The key risk drivers identified through sensitivity analysis suggest a cost contingency of $73.5M and schedule risks adding a potential 36 months; all at an 80% confidence level.

Cost Risks: From the CSRA, the key or greater Cost Risk items of include:

- 15 – Ability of Quarry to Produce Stone – Concern on the quarry capacity and lead time to mine and process stone tonnage. Catalina Island has two quarries: Pebbly Beach and Empire Quarry. The project may potentially require the use both quarries. Quarry production can affect schedule. Pressure to deliver on an accelerated schedule has impacts on costs. Not producing/delivering stone on schedule will significantly affect the project cost.
- 10 - Variation in estimated sediment quantity for Eelgrass beds -- Amount of sediment needed to establish eelgrass beds is in question. Amount of sediment may be different than what we have estimated for the eelgrass beds. More analysis will need to be performed in PED to optimize the design. As little as none and as much as 600,000 yd^3 may be needed to obtain the required elevation. 100,000 yd^3 of beach quality sand was assumed for cost estimating purposes and environmental consideration.
- 22 – Bidding Climate -- Marine construction is handled by a limited pool of contractors. Lack of competition may have a high impact on the construction cost.
- 1 – Adequacy of Project Funding -- There are concerns that given the total project cost, and the ecosystem restoration cost per habitat unit, the project may have difficulty obtaining funds. The scope could potentially be reduced to meet available budget.

Moderate risks, when combined, can also become a cost impact.

- 18 -- Estimate Captures Scope for All Project Features -- There is a risk of variability in estimated costs over the 50-year project life. A lot of variables may change the cost over the life of the project.
- 25 – Abnormal Weather Events – Abnormally excessive waves due to weather events could affect stone placement productivity from the derrick barge. Concern with the contractor not been able to complete the work within the construction window. Excessive waves due to weather events could slow stone placement or dredging productivity.

- 13 – Availability of Derrick Barges – Concern on limited number of derrick barges capable of lifting large armor stones.
- 7 – O&M costs on Open Water Reefs -- The PDT is confident the open water reefs will not be damaged during the 10-year Monitoring and Adaptive Management period, but if they are damaged, there is a potential for O&M costs. These costs would significantly affect the cost and the schedule. If the damaged occurs after the 10-yr monitoring and adaptive management period, costs would be incurred by the sponsor.
- 14 – Air Quality Restriction Issues – Concern with contractors' marine equipment compliance with the air quality standards.
- 20 – Stakeholders Request Late Changes – The PDT discussed the possibility that over the life of the project, stakeholders could request new scope items be added to the project.

Schedule Risks: From the CSRA, the key or greater Schedule Risk items include:

- 15 – Ability of Quarry to Produce Stone – Concern on the quarry capacity and lead time to mine and process stone tonnage. Quarry production can affect schedule - may hit a bad pocket of stone and not be able to produce quality needed at the time (delay construction).
- 1 – Adequacy of Project Funding -- There are concerns that given the total project cost, and the ecosystem restoration cost per habitat unit, the project may have difficulty obtaining funds. The project schedule may be delayed if one or more contracts are not funded in a timely manner.
- 7 – O&M costs on Open Water Reefs -- The PDT is confident the open water reefs will not be damaged during the 10-year Monitoring and Adaptive Management period, but if they are damaged, there is a potential for O&M costs. These costs would significantly affect the cost and the schedule. If the damaged occurs after the 10-yr monitoring and adaptive management period, costs would be incurred by the sponsor.
- 2 – Sponsor Funding Issues -- Ability for the sponsor to obtain funds from City Council would impact the overall project schedule.
- 8 – Cal Fish and Wildlife Permit -- Agency could withhold permitting unless we commit to removal of measures that do not perform. Risk occurrence is unlikely, but they could withhold permitting unless we commit to removal of measures that do not perform. USACE would not intend to commit to removal of measures, but if Cal F&W does not accept our response that could shut down the project.

Recommendations: The CSRA study serves as a “road map” towards project improvements and reduced risks over time. The PDT must include the recommended cost and schedule contingencies and incorporate risk monitoring and mitigation on those identified risks. Further iterative study and update of the risk analysis throughout the project life-cycle is important in support of remaining within an approved budget and appropriation.

MAIN REPORT

1.0 PURPOSE

Within the authority of the US Army Corps of Engineers (USACE), Los Angeles District, this report presents the efforts and results of the cost and schedule risk analysis for East San Pedro Bay Ecosystem Restoration Project. The report includes risk methodology, discussions, findings and recommendations regarding the identified risks and the necessary contingencies to confidently administer the project, presenting a cost and schedule contingency value with an 80% confidence level of successful execution.

2.0 BACKGROUND

Restoration features include 24 rocky reefs intended to support kelp beds (121 acres) along the breakwater and in open water, two open water rocky reefs (29 acres) by Island Chaffee, and six nearshore rocky reef shoals (20 acres) coupled with six eelgrass beds (30 acres). In total, this alternative intends to restore over 200 acres of rocky reef, eelgrass, and kelp habitat

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The project is broken down into seven (7) contracts. Contracts #1 and #7 consists on creating a rocky reef kelp habitat alongside the Long Beach Breakwater. Contracts #2 and # 3 consist on establishing an eelgrass habitat by building a rocky shoal nearshore. Contract #4 supplements Contract #2 and Contract #3 nearshore rocky shoal by importing sand from a designated borrow site to support growth and expansion of eelgrass. Contracts #5 and #6 consist on building rocky reefs in the center of the open water zone.

3.0 REPORT SCOPE

The scope of the risk analysis report is to identify cost and schedule risks with a resulting recommendation for contingencies at the 80 percent confidence level using the risk analysis processes, as mandated by U.S. Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works, ER 1110-2-1302, Civil Works Cost Engineering, and Engineer Technical Letter 1110-2-573, Construction Cost Estimating Guide for Civil Works. The report presents the contingency results for cost risks for construction features. The CSRA does not include consideration for life cycle costs.

3.1 Project Scope

The formal process included extensive involvement of the PDT for risk identification and the development of the risk register. The analysis process evaluated the Micro Computer Aided Cost Estimating System (MCACES) cost estimate, project schedule, and funding profiles using Crystal Ball software to conduct a *Monte Carlo* simulation and statistical sensitivity analysis, per the guidance in Engineer Technical Letter (ETL) CONSTRUCTION COST ESTIMATING GUIDE FOR CIVIL WORKS, dated September 30, 2008.

The project technical scope, estimates and schedules were developed and presented by the District. Consequently, these documents serve as the basis for the risk analysis.

The scope of this study addresses the identification of concerns, needs, opportunities and potential solutions that are viable from an economic, environmental, and engineering viewpoint.

3.2 USACE Risk Analysis Process

The risk analysis process for this study follows the USACE Headquarters requirements as well as the guidance provided by the Cost Engineering MCX. The risk analysis process reflected within this report uses probabilistic cost and schedule risk analysis methods within the framework of the Crystal Ball software. Furthermore, the scope of the report includes the identification and communication of important steps, logic, key assumptions, limitations, and decisions to help ensure that risk analysis results can be appropriately interpreted.

Risk analysis results are also intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as to provide tools to support decision making and risk management as the project progresses through planning and implementation. To fully recognize its benefits, cost and schedule risk analysis should be considered as an ongoing process conducted concurrent to, and iteratively with, other important project processes such as scope and execution plan development, resource planning, procurement planning, cost estimating, budgeting and scheduling.

In addition to broadly defined risk analysis standards and recommended practices, this risk analysis was performed to meet the requirements and recommendations of the following documents and sources:

- Cost and Schedule Risk Analysis Process guidance prepared by the USACE Cost Engineering MCX.

- Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated September 15, 2008.

- Engineer Technical Letter (ETL) CONSTRUCTION COST ESTIMATING GUIDE FOR CIVIL WORKS, dated September 30, 2008.

4.0 METHODOLOGY / PROCESS

Cost Engineering, Los Angeles District, facilitated a risk identification and qualitative analysis meeting with the PDT on June 10, 2021 to produce a risk register that served as the framework for the risk analysis.

Participants in the risk identification meeting in June 10, 2021 included:

Attendance	Name	Office
Full	Mark Cooke	Cost
Full	Eileen Takata	Lead Planner
Full	Matt Wesley	Coastal Engineering
Full	Stephen Woody	Coastal Studies
Partial	Susie Ming	Project Manager
Full	Chris Chabot	Planning / Environmental
Partial	Chris Solek	Planning
Full	Jeannine Hogg	Econ
Full	Julia Yang	Geotech
Partial	Lynette Ulloa	Real Estate
Reviewed	Monica Der Gevorgian	City of Long Beach PM

The draft CSRA model was completed on July 26, 2021 and submitted for ATR. On October 2021 ATR comments were received, addressed, and submitted for certification.

The risk analysis process for this study is intended to determine the probability of various cost outcomes and quantify the required contingency needed in the cost estimate to achieve the desired level of cost confidence. Per regulation and guidance, the P80 confidence level (80% confidence level) is the normal and accepted cost confidence level. District Management has the prerogative to select different confidence levels, pending approval from Headquarters, USACE.

In simple terms, contingency is an amount added to an estimate to allow for items, conditions or events for which the occurrence or impact is uncertain and that experience suggests will likely result in additional costs being incurred or additional time being required. The amount of contingency included in project control plans depends, at least in part, on the project leadership's willingness to accept risk of project overruns. The less risk that project leadership is willing to accept the more contingency should be

applied in the project control plans. The risk of overrun is expressed, in a probabilistic context, using confidence levels.

The Cost MCX guidance for cost and schedule risk analysis generally focuses on the 80-percent level of confidence (P80) for cost contingency calculation. It should be noted that use of P80 as a decision criteria is a risk averse approach (whereas the use of P50 would be a risk neutral approach, and use of levels less than 50 percent would be risk seeking). Thus, a P80 confidence level results in greater contingency as compared to a P50 confidence level. The selection of contingency at a particular confidence level is ultimately the decision and responsibility of the project's District and/or Division management.

The risk analysis process uses *Monte Carlo* techniques to determine probabilities and contingency. The *Monte Carlo* techniques are facilitated computationally by a commercially available risk analysis software package (Crystal Ball) that is an add-in to Microsoft Excel. Cost estimates are packaged into an Excel format and used directly for cost risk analysis purposes. The level of detail recreated in the Excel-format schedule is sufficient for risk analysis purposes that reflect the established risk register, but generally less than that of the native format.

The primary steps, in functional terms, of the risk analysis process are described in the following subsections. Risk analysis results are provided in Section 6.

4.1 Identify and Assess Risk Factors

Identifying the risk factors via the PDT is considered a qualitative process that results in establishing a risk register that serves as the document for the quantitative study using the Crystal Ball risk software. Risk factors are events and conditions that may influence or drive uncertainty in project performance. They may be inherent characteristics or conditions of the project or external influences, events, or conditions such as weather or economic conditions. Risk factors may have either favorable or unfavorable impacts on project cost and schedule.

A formal PDT meeting was held with the District office and project owners for the purposes of identifying and assessing risk factors. The meeting included capable and qualified representatives from multiple project team disciplines and functions, including project management, cost engineering, design, environmental compliance, real estate, construction, and contracting.

The initial formal meetings focused primarily on risk factor identification using brainstorming techniques, but also included some facilitated discussions based on risk factors common to projects of similar scope and geographic location. Additionally, numerous conference calls and informal meetings were conducted throughout the risk analysis process on an as-needed basis to further facilitate risk factor identification, market analysis, and risk assessment.

4.2 Quantify Risk Factor Impacts

The quantitative impacts (putting it to numbers of cost and time) of risk factors on project plans were analyzed using a combination of professional judgment, empirical data and analytical techniques. Risk factor impacts were quantified using probability distributions (density functions) because risk factors are entered into the Crystal Ball software in the form of probability density functions.

Similar to the identification and assessment process, risk factor quantification involved multiple project team disciplines and functions. However, the quantification process relied more extensively on collaboration between cost engineering and risk analysis team members with lesser inputs from other functions and disciplines. This process used an iterative approach to estimate the following elements of each risk factor:

- Maximum possible value for the risk factor
- Minimum possible value for the risk factor
- Most likely value (the statistical mode), if applicable
- Nature of the probability density function used to approximate risk factor uncertainty
- Mathematical correlations between risk factors
- Affected cost estimate and schedule elements

The resulting product from the PDT discussions is captured within a risk register as presented in section 6 for both cost and schedule risk concerns. Note that the risk register records the PDT's risk concerns, discussions related to those concerns, and potential impacts to the current cost and schedule estimates. The concerns and discussions support the team's decisions related to event likelihood, impact, and the resulting risk levels for each risk event.

4.3 Analyze Cost Estimate and Schedule Contingency

Contingency is analyzed using the Crystal Ball software, an add-in to the Microsoft Excel format of the cost estimate and schedule. *Monte Carlo* simulations are performed by applying the risk factors (quantified as probability density functions) to the appropriate estimated cost and schedule elements identified by the PDT. Contingencies are calculated by applying only the moderate and high level risks identified for each option (i.e., low-level risks are typically not considered, but remain within the risk register to serve historical purposes as well as support follow-on risk studies as the project and risks evolve).

For the cost estimate, the contingency is calculated as the difference between the P80 cost forecast and the baseline cost estimate. Each option-specific contingency is then allocated on a civil works feature level based on the dollar-weighted relative risk of each feature as quantified by *Monte Carlo* simulation. Standard deviation is used as the

feature-specific measure of risk for contingency allocation purposes. This approach results in a relatively larger portion of all the project feature cost contingency being allocated to features with relatively higher estimated cost uncertainty.

5.0 PROJECT ASSUMPTIONS

The following data sources and assumptions were used in quantifying the costs associated with the project.

a. The MII MCACES (Micro-Computer Aided Cost Estimating Software) files as well as accompanying CEDEP files were the basis for the cost and schedule risk analyses.

b. The cost comparisons and risk analyses performed and reflected within this report are based on design scope and estimates that are at the feasibility level of design.

c. Schedules are analyzed for impact to the project cost in terms of delayed funding, uncaptured escalation (variance from OMB factors and the local market) and unavoidable fixed contract costs and/or languishing federal administration costs incurred throughout delay.

d. The Cost Engineering MCX guidance generally focuses on the eighty-percent level of confidence (P80) for cost contingency calculation. For this risk analysis, the eighty-percent level of confidence (P80) was used. It should be noted that the use of P80 as a decision criteria is a moderately risk averse approach, generally resulting in higher cost contingencies. However, the P80 level of confidence also assumes a small degree of risk that the recommended contingencies may be inadequate to capture actual project costs.

e. Only high and moderate risk level impacts, as identified in the risk register, were considered for the purposes of calculating cost contingency. Low level risk impacts should be maintained in project management documentation, and reviewed at each project milestone to determine if they should be placed on the risk “watch list”.

6.0 RESULTS

The cost and schedule risk analysis results are provided in the following sections. In addition to contingency calculation results, sensitivity analyses are presented to provide decision makers with an understanding of variability and the key contributors to the cause of this variability.

6.1 Risk Register

A risk register is a tool commonly used in project planning and risk analysis. The actual risk register is provided in Appendix A. The complete risk register includes low level risks, as well as additional information regarding the nature and impacts of each risk.

It is important to note that a risk register can be an effective tool for managing identified risks throughout the project life cycle. As such, it is generally recommended that risk registers be updated as the designs, cost estimates, and schedule are further refined, especially on large projects with extended schedules. Recommended uses of the risk register going forward include:

- Documenting risk mitigation strategies being pursued in response to the identified risks and their assessment in terms of probability and impact.
- Providing project sponsors, stakeholders, and leadership/management with a documented framework from which risk status can be reported in the context of project controls.
- Communicating risk management issues.
- Providing a mechanism for eliciting feedback and project control input.
- Identifying risk transfer, elimination, or mitigation actions required for implementation of risk management plans.

6.2 Cost Contingency and Sensitivity Analysis

The result of risk or uncertainty analysis is quantification of the cumulative impact of all analyzed risks or uncertainties as compared to probability of occurrence. These results, as applied to the analysis herein, depict the overall project cost at intervals of confidence (probability).

Table 1 provides the construction cost contingencies calculated for the P80 confidence level and rounded to the nearest thousand. The construction cost contingencies for the P5, P50 and P90 confidence levels are also provided for illustrative purposes only.

Table 1. Construction Cost Contingency Summary

Base Case Construction Cost Estimate	**$179,224,000**		
Confidence Level	**Construction Value ($$) w/ Contingencies**	**Contingency (%)**	**Contingency $**
50%	$240,160,160	34%	$60,936,160
80%	**$252,705,840**	**41%**	**$73,481,840**
90%	$259,874,800	45%	$80,650,800

6.2.1 Sensitivity Analysis

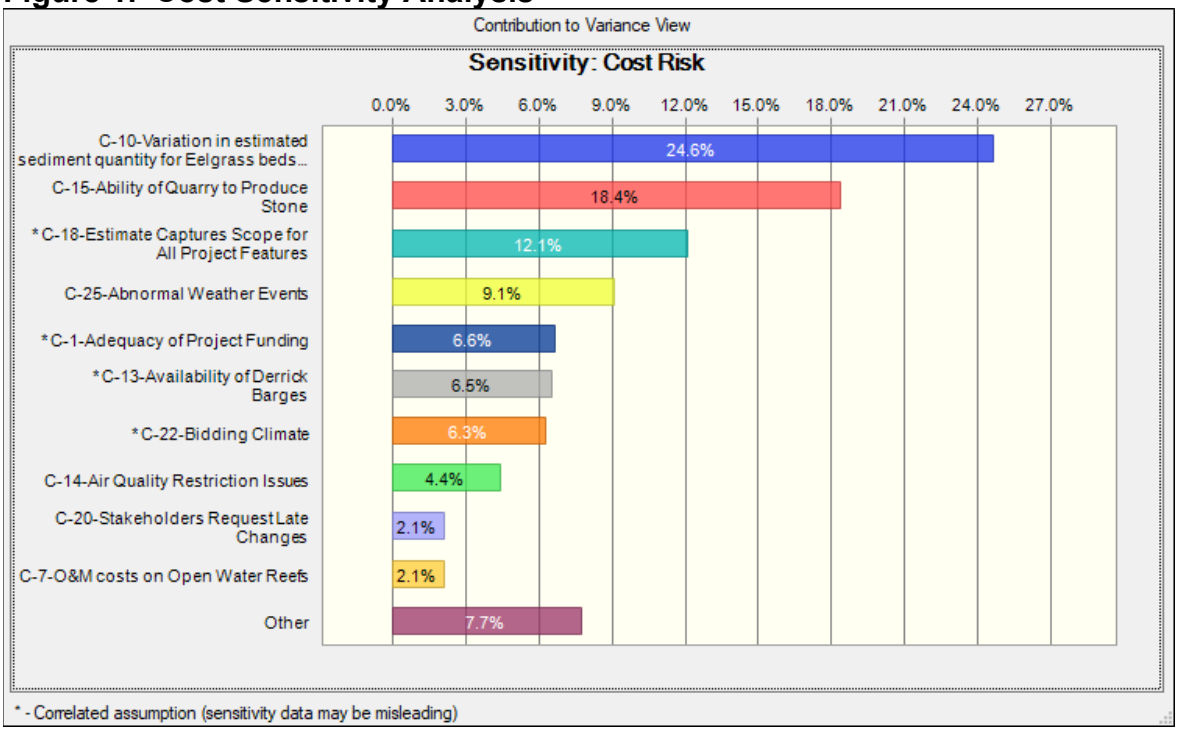
Sensitivity analysis generally ranks the relative impact of each risk/opportunity as a percentage of total cost uncertainty. The Crystal Ball software uses a statistical measure (contribution to variance) that approximates the impact of each risk/opportunity contributing to variability of cost outcomes during *Monte Carlo* simulation.

Key cost drivers identified in the sensitivity analysis can be used to support development of a risk management plan that will facilitate control of risk factors and their potential impacts throughout the project lifecycle. Together with the risk register, sensitivity analysis results can also be used to support development of strategies to eliminate, mitigate, accept or transfer key risks.

6.2.2 Sensitivity Analysis Results

The risks/opportunities considered as key or primary cost drivers and the respective value variance are ranked in order of importance in contribution to variance bar charts. Opportunities that have a potential to reduce project cost and are shown with a negative sign; risks are shown with a positive sign to reflect the potential to increase project cost. A longer bar in the sensitivity analysis chart represents a greater potential impact to project cost.
Figure 1 presents a sensitivity analysis for cost growth risk from the high level cost risks identified in the risk register. Likewise, Figure 2 presents a sensitivity analysis for schedule growth risk from the high level schedule risks identified in the risk register.

Figure 1. Cost Sensitivity Analysis



6.3 Schedule and Contingency Risk Analysis

The result of risk or uncertainty analysis is quantification of the cumulative impact of all analyzed risks or uncertainties as compared to probability of occurrence. These results, as applied to the analysis herein, depict the overall project duration at intervals of confidence (probability).

Table 2 provides the schedule duration contingencies calculated for the P80 confidence level. The schedule duration contingencies for the P50 and P90 confidence levels are also provided for illustrative purposes.

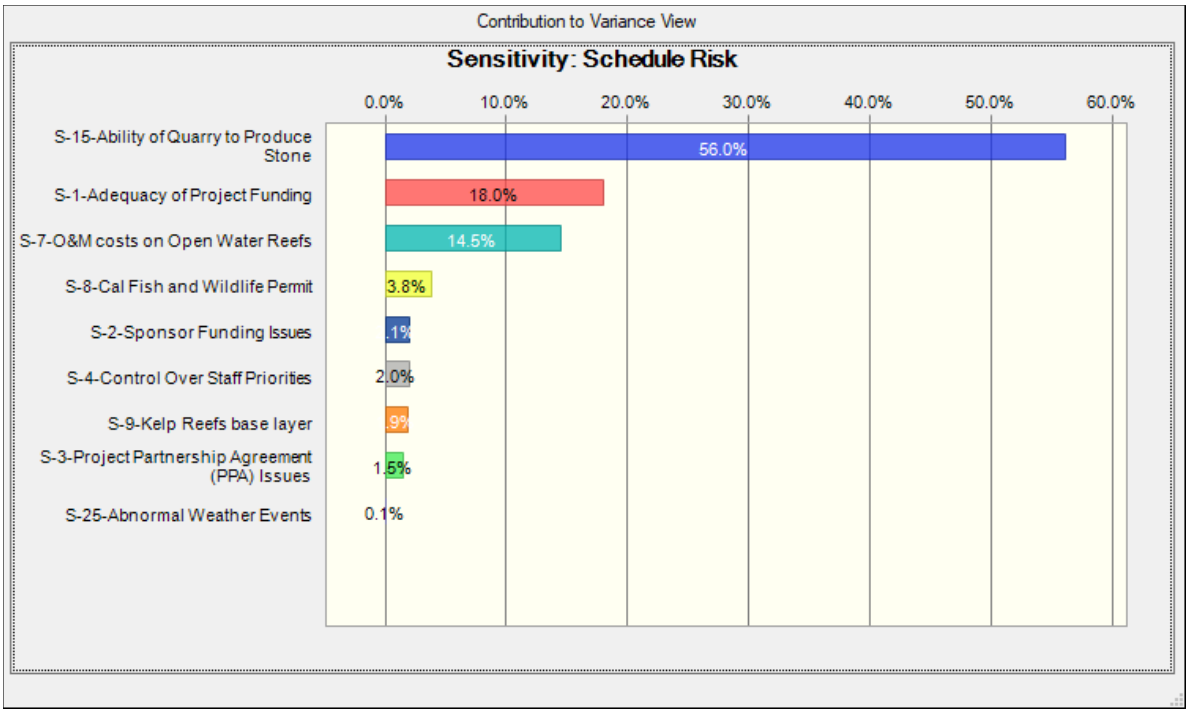
These contingencies were used to calculate the projected residual fixed cost impact of project delays that are included in the Table 1 presentation of total cost contingency. The schedule contingencies were calculated by applying the high level schedule risks identified in the risk register for each option to the durations of critical path and near critical path tasks.

The schedule was not resource loaded and contained open-ended tasks and non-zero lags (gaps in the logic between tasks) that limit the overall utility of the schedule risk analysis. These issues should be considered as limitations in the utility of the schedule contingency data presented. Schedule contingency impacts presented in this analysis are based solely on projected residual fixed costs.

Table 2. Schedule Duration Contingency Summary

Risk Analysis Forecast (base schedule of 163 months)	Duration w/ Contingencies (months)	Contingency (months)
50% Confidence	191	28
80% Confidence	199	36
90% Confidence	202	39

Figure 2. Schedule Sensitivity Analysis



7.0 MAJOR FINDINGS/OBSERVATIONS/RECOMMENDATIONS

This section provides a summary of significant risk analysis results that are identified in the preceding sections of the report. Risk analysis results are intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as to provide tools to support decision making and risk management as projects progress through planning and implementation. Because of the potential for use of risk analysis results for such diverse purposes, this section also reiterates and highlights important steps, logic, key assumptions, limitations, and decisions to help ensure that the risk analysis results are appropriately interpreted.

7.1 Major Findings/Observations

Project cost and schedule comparison summaries are provided in Table 3 and Table 4 respectively. Additional major findings and observations of the risk analysis are listed below.

The PDT worked through the risk register in June 10, 2021. The key risk drivers identified through sensitivity analysis suggest a cost contingency of $73.5M and schedule risks adding a potential 36 months; all at an 80% confidence level.

Cost Risks: From the CSRA, the key or greater Cost Risk items of include:

- 15 – Ability of Quarry to Produce Stone – Concern on the quarry capacity and lead time to mine and process stone tonnage. Catalina Island has two quarries: Pebbly Beach and Empire Quarry. The project may potentially require the use both quarries. Quarry production can affect schedule. Pressure to deliver on an accelerated schedule has impacts on costs. Not producing/delivering stone on schedule will significantly affect the project cost.
- 10 - Variation in estimated sediment quantity for Eelgrass beds -- Amount of sediment needed to establish eelgrass beds is in question. Amount of sediment may be different than what we have estimated for the eelgrass beds. More analysis will need to be performed in PED to optimize the design. As little as none and as much as 600,000 yd^3 may be needed to obtain the required elevation. 100,000 yd^3 of beach quality sand was assumed for cost estimating purposes and environmental consideration.
- 22 – Bidding Climate -- Marine construction is handled by a limited pool of contractors. Lack of competition may have a high impact on the construction cost.
- 1 – Adequacy of Project Funding -- There are concerns that given the total project cost, and the ecosystem restoration cost per habitat unit, the project may have difficulty obtaining funds. The scope could potentially be reduced to meet available budget.

Moderate risks, when combined, can also become a cost impact.

- 18 -- Estimate Captures Scope for All Project Features -- There is a risk of variability in estimated costs over the 50-year project life. A lot of variables may change the cost over the life of the project.
- 25 – Abnormal Weather Events – Abnormally excessive waves due to weather events could affect stone placement productivity from the derrick barge. Concern with the contractor not been able to complete the work within the construction window. Excessive waves due to weather events could slow stone placement or dredging productivity.
- 13 – Availability of Derrick Barges – Concern on limited number of derrick barges capable of lifting large armor stones.
- 7 – O&M costs on Open Water Reefs -- The PDT is confident the open water reefs will not be damaged during the 10-year Monitoring and Adaptive Management period, but if they are damaged, there is a potential for O&M costs. These costs would significantly affect the cost and the schedule. If the damaged occurs after the 10-yr monitoring and adaptive management period, costs would be incurred by the sponsor.
- 14 – Air Quality Restriction Issues – Concern with contractors' marine equipment compliance with the air quality standards.

- 20 – Stakeholders Request Late Changes – The PDT discussed the possibility that over the life of the project, stakeholders could request new scope items be added to the project.

Schedule Risks: From the CSRA, the key or greater Schedule Risk items include:

- 15 – Ability of Quarry to Produce Stone – Concern on the quarry capacity and lead time to mine and process stone tonnage. Quarry production can affect schedule - may hit a bad pocket of stone and not be able to produce quality needed at the time (delay construction).
- 1 – Adequacy of Project Funding -- There are concerns that given the total project cost, and the ecosystem restoration cost per habitat unit, the project may have difficulty obtaining funds. The project schedule may be delayed if one or more contracts are not funded in a timely manner.
- 7 – O&M costs on Open Water Reefs -- The PDT is confident the open water reefs will not be damaged during the 10-year Monitoring and Adaptive Management period, but if they are damaged, there is a potential for O&M costs. These costs would significantly affect the cost and the schedule. If the damaged occurs after the 10-yr monitoring and adaptive management period, costs would be incurred by the sponsor.
- 2 – Sponsor Funding Issues -- Ability for the sponsor to obtain funds from City Council would impact the overall project schedule.
- 8 – Cal Fish and Wildlife Permit -- Agency could withhold permitting unless we commit to removal of measures that do not perform. Risk occurrence is unlikely, but they could withhold permitting unless we commit to removal of measures that do not perform. USACE would not intend to commit to removal of measures, but if Cal F&W does not accept our response that could shut down the project.

Table 3. Construction Cost Comparison Summary (Uncertainty Analysis)

PROJECT COST BASE ESTIMATE	$179,224,000		
Confidence Level	**Project First Cost**	**Contingency**	**Contingency %**
0%	$189,977,440	$10,753,440	6.00%
10%	$218,653,280	$39,429,280	22.00%
20%	$225,822,240	$46,598,240	26.00%
30%	$231,198,960	$51,974,960	29.00%
40%	$236,575,680	$57,351,680	32.00%
50%	$240,160,160	$60,936,160	34.00%
60%	$243,744,640	$64,520,640	36.00%
70%	$247,329,120	$68,105,120	38.00%
80%	$252,705,840	$73,481,840	41.00%
90%	$259,874,800	$80,650,800	45.00%
100%	$286,758,400	$107,534,400	60.00%

Table 4. Construction Schedule Comparison Summary (Uncertainty Analysis)

Base Schedule Duration	162.8 Months		
Confidence Level	**Duration**	**Contingency**	**Contingency %**
0%	164.4 Months	1.6 Months	1%
10%	179.1 Months	16.3 Months	10%
20%	182.4 Months	19.5 Months	12%
30%	185.6 Months	22.8 Months	14%
40%	187.2 Months	24.4 Months	15%
50%	190.5 Months	27.7 Months	17%
60%	192.1 Months	29.3 Months	18%
70%	195.4 Months	32.6 Months	20%
80%	198.6 Months	35.8 Months	22%
90%	201.9 Months	39.1 Months	24%
100%	218.2 Months	55.4 Months	34%

7.2 Recommendations

Risk Management is an all-encompassing, iterative, and life-cycle process of project management. The Project Management Institute's (PMI) *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, *4th edition*, states that "project risk management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project." Risk identification and analysis are processes within the knowledge area of risk management. Its outputs pertinent to this effort include the risk register, risk quantification (risk analysis model), contingency report, and the sensitivity analysis.

The intended use of these outputs is implementation by the project leadership with respect to risk responses (such as mitigation) and risk monitoring and control. In short, the effectiveness of the project risk management effort requires that the proactive management of risks not conclude with the study completed in this report.

The Cost and Schedule Risk Analysis (CSRA) produced by the PDT identifies issues that require the development of subsequent risk response and mitigation plans. This section provides a list of recommendations for continued management of the risks identified and analyzed in this study. Note that this list is not all inclusive and should not substitute a formal risk management and response plan.

The CSRA study serves as a "road map" towards project improvements and reduced risks over time. The PDT must include the recommended cost and schedule contingencies and incorporate risk monitoring and mitigation on those identified risks. Further iterative study and update of the risk analysis throughout the project life-cycle is important in support of remaining within an approved budget and appropriation.

Risk Management: Project leadership should use of the outputs created during the risk analysis effort as tools in future risk management processes. The risk register should be updated at each major project milestone. The results of the sensitivity analysis may also be used for response planning strategy and development. These tools should be used in conjunction with regular risk review meetings.

Risk Analysis Updates: Project leadership should review risk items identified in the original risk register and add others, as required, throughout the project life-cycle. Risks should be reviewed for status and reevaluation (using qualitative measure, at a minimum) and placed on risk management watch lists if any risk's likelihood or impact significantly increases. Project leadership should also be mindful of the potential for secondary (new risks created specifically by the response to an original risk) and residual risks (risks that remain and have unintended impact following response).

APPENDIX A

REF	Risk Type	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Likelihood (C)	Impact (C)	Risk Level (C)	Likelihood (S)	Impact (S)	Risk Level (S)
1	01 - Project & Program Management (PM)	Adequacy of Project Funding	There are concerns that given the total project cost and the ecosystem restoration cost per habitat unit, the project may have difficulty obtaining funds. The scope could potentially be reduced to meet available budget.	Funding will eventually be allocated. However, as project advances, budget shortfalls may reduce the scope to stay within provided funding. Consider the projects ability to scope to budget. The project schedule may be delayed if one or more contracts are not funded in a timely manner affecting cost and schedule.	Likely	Significant	High	Likely	Significant	High
2	01 - Project & Program Management (PM)	Sponsor Funding Issues	Significant funding required from the local sponsor (City of Long Beach).	Ability for the sponsor to obtain funds from City Council would impact the overall project schedule	Likely	Negligible	Low	Possible	Moderate	Medium
3	01 - Project & Program Management (PM)	Project Partnership Agreement (PPA) Issues	The execution and finalization of the Project Parthership Agreement (PPA) may cause delays. Show-stopping issues are not anticipated, but it could have an impact if the final agreements are delayed.	The District has a PPA template and approval is expected, although any difficulties in sponsor or USACE approvals of the PPA could delay the project. This could have an impact on the overall implementation schedule, as the Government cannot advertise until the Project Partnership Agreement (PPA) is signed. No major cost issues anticipated.	Unlikely	Negligible	Low	Possible	Moderate	Medium
4	01 - Project & Program Management (PM)	Control Over Staff Priorities	Project will compete with higher profile projects over staff priorities	This has an effect on controlling staff priorities of work for short periods of time. This could have a larger effect, as it pertains to the schedule.	Possible	Marginal	Low	Very Likely	Marginal	Medium

5	01 - Project & Program Management (PM)	**Separate Contract Awards**	**The estimate is build under the assumption that there will be seven (7) distinctive contracts to accommodate identified quarry stone production.**	**Splitting up the project into more contracts may affect ability to perform future work and extends chances for previously identified project risks. Armor stone contracts limited by production of quarry from conversations with Mike Ellis of Catalina Quarry (a.k.a. Pebbly Beach) - production limited to ~80,000 tons per contract.**	Likely	Marginal	**Medium**	Unlikely	Moderate	**Low**
6	05 - Contract Acquisition Risks (CA)	**Contracts Delays**	**Separate contracts, particularly, the ones that are sequential and in the same work area create inter-dependent schedule risks.**	**Delays or issues with one contract may affect subsequent contracts. The project schedule assumes the first contract will be the Kelp Reef Construction near the breakwater and it occurs prior to the 2028 Olympics. Risk that design data and agency coordination could become too old if we wait too long to begin construction likely impacting cost. Schedule risk is seen as low since the project schedule accounts for the no-work period during the 2028 Olympics.**	Likely	Marginal	**Medium**	Unlikely	Moderate	**Low**
7	02 - Scope and Objectives (SC)	**O&M costs on Open Water Reefs**	**Current estimate assumes no O&M is required on any of the project features.**	**The PDT is confident the open water reefs will not be damaged during the 10-year Monitoring and Adaptive Management period, but if they are damaged, there is a potential for O&M costs. These cost would significantly affect the cost and the schedule. If the damaged occurs after the 10-yr monitoring and adaptive management period, costs would be incurred by the sponsor.**	Unlikely	Significant	**Medium**	Unlikely	Significant	**Medium**
8	03 - Ability to Execute (AB)	**Cal Fish and Wildlife Permit**	**Agency could withhold permitting unless we commit to removal of measures that do not perform.**	**USACE would remove reefs if they are not performing as intended per previous correspondece with Cal Fish and Wildlife. Agencies present on Technical Advisory Commity. Risk occurrence is unlikely, but they could withhold permitting unless we commit to removal of measures that do not perform. USACE would not intend to commit to removal of measures, but if Cal F&W would not accept our response that could shut down the project. Comment: "Should the sections of the Project not be successful that include placement of structure, the Department recommends that financial assurance be put in place to pay for removal should success not be possible." It is unlikely that construcion measures will fail their intent.**	Unlikely	Critical	**Medium**	Unlikely	Critical	**Medium**

9	13 - Design (DS)	**Kelp Reefs base layer**	**Need to confirm density of existing sand foundation to determine if a base layer is required for Kelp Reefs.**	**Potential need for a base layer if exiting substrate is not suitable for Kelp Reefs (i.e. avoid kelp reef sinking) - up to 100% increase in quantity possible. THUMS islands have not settled, but they used larger stone. Uncertainty could be mitigated by using larger stone for kelp reefs. High chance to place an additional 25% of stone due to settlement.**	Likely	Significant	**High**	Likely	Moderate	**Medium**
10	13 - Design (DS)	**Variation in estimated sediment quantity for Eelgrass beds**	**Amount of sediment needed to establish eelgrass beds is in question.**	**Amount of sediment may be different than what we have estimated for the eelgrass beds. More analysis will need to be performed in PED to optimize the design. As little as none and as much as 600,000 yd³ may be needed to obtain the required elevation. 100,000 yd³ of beach quality sand was assumed for cost estimating purposes and environmental consideration.**	Very Likely	Significant	**High**	Possible	Marginal	**Low**
11	13 - Design (DS)	**Current Eelgrass location**	**Presence of Eelgrass in the nearshore areas will affect construction. Eelgrass beds locations would need to be move.**	**If Eelgrass is present in the area, we would be limited in our operation and placement of measures. The Corp has an eelgrass survey from 2016 confirming no eelgrass in the area. There is a potential to find eelgrass in the area between Belmont Pier and Alamitos Bay. Project may have to move nearshore reefs / eelgrass placement. Ability to do so is possible, unless there is a significant amount of eelgrass present. If they need to be moved into deeper water it would increase quantities and therefore costs. Also increases impacts to recreation - boaters / windsurfers. Likely we would need to move / reconfigure nearshore reef placement.**	Likely	Significant	**High**	Likely	Marginal	**Medium**
12	09 - Environmental & Cultural/Historical Resources (EC)	**Quantiy variation on Kelp and Eelgrass transplantation**	**Kelp / Eelgrass transplantation assumptions could vary. Risk is associated with Monitoring and Adaptive Management (MAMP) costs.**	**Assumptions for quantity transplantation is ~25%. Potential for eelgrass and kelp transplatation quantities to increase. How much eelgrass to transplant and availabilty of material to transplant is unknown. Kelp unlikely to require transplantation events. MAMP cost accounts for two (2) transplantation events and 3 acres. There is a potential for 1 more transplantation event. Based on 2016 eelgrass map, it appears to be sufficient eelgrass beds for transplantation. 10 acres in ESPB, and 40 acres in ports. Eelgrass is dynamic, and we have 2016 data. Potential for $1M in cost impacts. Also potential we need less than assumed 2 events. Project schedule is not affected.**	Likely	Moderate	**Medium**	Unlikely	Negligible	**Low**

13	24 - Equipment List (EQ)	**Availability of Derrick Barges**	**Concern on limited number of derrick barges capable of lifting large armor stones.**	**Number of derrick barges on the west coast . Basis of estimate assumes the 300-ton Derrick Barge Long Beach (DBLB) operated by Connelly Pacific. Manson also has equipment capable to perform the work. Cost to mobilize equipment from other parts of the country will either limit bidders or increase mob/demob costs. This equipment is regurlarly used for SoCal coastal structure repairs with similar armor stone size. Support vessels are readily available.**	Unlikely	Significant	**Medium**	Unlikely	Marginal	**Low**
14	09 - Environmental & Cultural/Historical Resources (EC)	**Air Quality Restriction Issues**	**There has been some concern about marine equipment compliance with the air quality standards.**	**This issue affects the bidding competition for the dredging industry due to rule changes to comply with air quality standards. Local regulators are requiring onerous requirements specific to engines, dredge configuration, etc making it very difficult for dredging companies to comply with the air quality standards. Limiting competition among marine contractors affects cost.**	Very Likely	Marginal	**Medium**	Unlikely	Negligible	**Low**
15	22 - Construction (CO)	**Ability of Quarry to Produce Stone**	**Concern on the quarry capacity and lead time to mine and process stone tonnage. Quarry production can affect schedule - may hit a bad pocket of stone and not be able to produce quality needed at the time (delay construction).**	**Catalina Island has two quarries: Pebbly Beach and Empire Quarry. The project may potentially require the use both quarries. Empire Quarry stone is suitable for the Kelp Reefs. Nearshore contracts require the stone from Pebbly Beach for greater density. If the Empire Quarry is employed, Kelp Reef stone pricing has potential for 10% in material savings, since the stone has same volume with 10% less density (pricing is the same per TON, but cheaper per CY).** **Pressure to deliver on an accelerated schedule has impacts on costs. Not producing/delivering stone on schedule will significantly affect the project.**	Likely	Significant	**High**	Likely	Significant	**High**

16	22 - Construction (CO)	**Claims/Modifications**	**This item captures the risk that post-award construction modifications or claims may cause a variance to project cost and schedule.**	**Possible claims and modifications may rise affecting the cost. The whole project will not be delayed, but individual contracts may carry schedule delays.**	Likely	Moderate	**Medium**	Likely	Marginal	**Medium**
17	19 - Estimate and Schedule Risks (ES)	**Marine Fuel Prices**	**Upward trend in fuel prices. An upward trend in the price of fuel oil has also created an upward trend in prices of construction materials.**	**Fuel price variations will affect all construction contracts costs.**	Possible	Moderate	**Medium**	Unlikely	Negligible	**Low**
18	19 - Estimate and Schedule Risks (ES)	**Estimate Captures Scope for All Project Features**	**There is a risk of variability in estimated costs over the 50-year project life.**	**This is not seen as a major risk item, although it exists. A lot of variables may change the cost over the life of the project.**	Likely	Marginal	**Medium**	Unlikely	Marginal	**Low**
19	19 - Estimate and Schedule Risks (ES)	**PED and CM Cost Increase**	**Increase in PED and CM Costs (30 & 31 Accounts).**	**Project features are in the preliminary stages. This item captures the risk that the costs for PED and CM could increase from beyond the currently estimated cost. Overall project schedule is unaffected.**	Likely	Marginal	**Medium**	Unlikely	Marginal	**Low**
20	04 - External Risks (EX)	**Stakeholders Request Late Changes**	**The PDT discussed the possibility that over the life of the project, stakeholders could request new scope items be added to the project.**	**It is unlikely that the Port of Long Beach, City of Long Beach, or Navy will request changes to the current project scope. Limited maintenance is expected and only applies to the nearshore rocky reef structures. It is expected that maintenance will be conducted every 10 years or as needed after large storm events to restore the structure to the design parameters. Kelp reefs will not require maintenance; individual stones have the potential to mobilize during the extremely rare events but will not limit the potential to grow kelp. Over the course of the 50-year life of the project, it is likely that changes will be requested affecting project cost.**	Likely	Marginal	**Medium**	Unlikely	Negligible	**Low**

21	04 - External Risks (EX)	**Low or not studied risks**	**This item captures the risk that low or unknown internal risks may cause a variance to project cost and schedule.**	**Risk based on standard items not included in the formal cost and schedule risk analyses, such as sufficient studies.**	Likely	Marginal	**Medium**	Likely	Marginal	**Medium**
22	04 - External Risks (EX)	**Bidding Climate**	**Marine construction is handled by a limited pool of contractors.**	**Lack of competition may have a high impact on the construction cost.**	Very Likely	Significant	**High**	Unlikely	Negligible	**Low**
23	04 - External Risks (EX)	**Inflation Volatility**	**Project cost is largely dependent on local stone material pricing. CWCCIS inflation factors may not fully capture or reflect the progressive increase in prices.**	**CWCCIS tables show 2.5% per year on average (WBS 06- years 2020 thru 2040). Inflation may increase higher than the inflation factors captured by the CWCCIS tables.**	Likely	Moderate	**Medium**	Unlikely	Marginal	**Low**
24	04 - External Risks (EX)	**Sea Level Change**	**Physical effects of projected future sea level change across the project life cycle.**	**Risk revolves around potential changes in base quantities for nearshore reefs. Long Beach sea level rise is relatively low compared to other areas (3 ft in 100 years). Nearshore reefs / eelgrass may be impacted since they are tied to depth - kelp reefs and open water reefs are not impacted by the seal level rise. Risk could add additional stone to nearshore reefs to offset sea level rise impacts.**	Likely	Marginal	**Medium**	Unlikely	Negligible	**Low**

25	04 - External Risks (EX)	**Abnormal Weather Events**	**Abnormally excessive waves due to weather events could affect stone placement productivity from the derrick barge.**	**The issue is that the contractor would not be able to complete the work within the construction window, Excessive waves due to weather events could slow stone placement or dredging productivity. El Niño usually occurs irregularly, approximately every 2 to 7 years. El Niño typically last 9 to 12 months. Assume every 15 years there is a chance of abnormal weather or wave issues. Cost and schedule risks are seen as medium.**	Unlikely	Significant	**Medium**	Unlikely	Significant	**Medium**
26	04 - External Risks (EX)	**Coast Guard Funding Cycle**	**Coast Guard needs to fund Aids to Navigation**	**Coast Guard will need to cover costs for Aids to Navigation (ATON). Funding from different government department could slow process. Construction may be delayed if Coast Guard funding for ATON is not there. Overall project schedule will not be impacted, but assume schedule on any single contract may be affected.**	Unlikely	Negligible	**Low**	Likely	Marginal	**Medium**
27	04 - External Risks (EX)	**Huntington Beach Oil Spill**	**A large oil spill from an oil rig platform pipeline in the Huntington Beach area occurred on Oct 4, 2021.**	**The spill occurred near the project site, but until sampling and testing are completed in the area, the team does not know the extend of the impact. Sea currents flow south oil may settle southward away from the project site. However, mitigation costs may be expensive if the oil settles within the borrow site (Sufside/Sunset) or by the areas where the stones are to be placed.**	Possible	Moderate	**Medium**	Unlikely	Negligible	**Low**

28	01 - Project & Program Management (PM)	**Continuing Contract Clause**	**If the initial construction is not fully funded, the Continuing Contract Clause will need to be exercised.**	**Standard Continuing Contract Clause increases the risk of contractors increasing their prices.**	Possible	Marginal	**Low**	Possible	Marginal	**Low**
29	01 - Project & Program Management (PM)	**Coordination / Communication Difficulties**	**There is the inherent possibility of communication challenges (both internal on the PDT and external with the outside/resource agencies) that affect the overall project cost and schedule risks for implementation. This is not going to stop the project, but could have delay impacts.**	**This issue could have nominal cost and implementation schedule impacts. Since the project delivery encompass few members and there are few outside entities, the PDT feels that this risk carries low cost and schedule impacts.**	Unlikely	Negligible	**Low**	Unlikely	Negligible	**Low**
30	01 - Project & Program Management (PM)	**Unplanned Work that Must be Accommodated**	**If the feasibility study does not obtain approval via the Chief's Report in a timely manner, it could cause rework of all of the feasibility work (in the PED phase).**	**This risk specifically pertains to schedule risk. It is possible that there are issues discovered during the feasibility period that would cause changes to documents, but the schedule impacts are expected to be marginal.**	Unlikely	Negligible	**Low**	Possible	Marginal	**Low**
31	05 - Contract Acquisition Risks (CA)	**Inefficient or Inexperienced Contractor**	**Contractor not understanding specifications and/or construction standards.**	**Lack of understanding specs and construction standards by the contractor may result into material placement issues. The nature of this type of work makes this unlikely. There are capable marine contractors in the area. Best value trade-off or LPTA contract can reduce the risk of an inexperienced contractor, but the scope of work is not technical enough to warrant the need**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
32	02 - Scope and Objectives (SC)	**Environmental Restoration Scope**	**Scope changes resulting from habitat mapping**	**Project scope involved in each measure is fairly straight forward and it involves stone placement of various sizes and configurations. Additional habitat mapping is not anticipated. Scope is very unlikely to change in any meaningful way.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
33	02 - Scope and Objectives (SC)	**Additional Geotech Investigations**	**Potential for additional geotech investigations costs**	**Potential for increase in geotech investigation scope during PED is low since substrate is fairly uniform. Geotechnical investigation costs under the initial PED phase are already high-priced.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**

34	09 - Environmental & Cultural/Historical Resources (EC)	**Major Rehabilitation during Adaptive Management Period (MAMP)**	**Major rehabilitation events during the 10-year Monitoring and Adaptive Management period (MAMP_**	**Major rehabilitation events could occur approximately every 10 years. Estimate accouns for kelp and eelgrass rehabilitation under MAMP costs. Cost and Schedule risk are seen as low.**	Unlikely	Moderate	**Low**	Possible	Marginal	**Low**
35	13 - Design (DS)	**Shifting Reefs locations during Design**	**Concern on need to move reefs locations based on design constraints or public input**	**Moving open water reefs or kelp reefs will not affect quantities or construction operations, so therefore will not affect costs. Will also have the same benefits (tied to relief from substrate).**	Possible	Marginal	**Low**	Possible	Marginal	**Low**
36	22 - Construction (CO)	**Availability of Clamshell Dredges**	**Concern on number of Clamshell Dredges on the West Coast.**	**Risk is associated with bringing in sand from a designated borrow site to create a bench to support growth and expansion of eelgrass. Risk is minimal since there are an adequate number of clamshell dredges in the SoCal area.**	Unlikely	Marginal	**Low**	Unlikely	Negligible	**Low**
37	01 - Project & Program Management (PM)	**State Land Permits**	**The COE has to obtain a State Land Permit for the borrow sites and the placement sites. The risk would be that State Lands may not want to give the permit to the sponsors.**	**The worst case scenario is that this would require that the PDT selects a different borrow site. There is the possibility that some additional surveys may be required, as it pertains to habitat and wildlife issues. This risk is seen as highly unlikely.**	Unlikely	Marginal	**Low**	Unlikely	Marginal	**Low**
38	18 - Hazardous Materials (HZ)	**Hazardous Waste Concerns (HTRW)**	**Potential hazardous waste concerns for the project.**	**No hazardous waste is anticipated. No known HTRW issues. Not anticipating to excavate any hazardous material from the borrow site. The Surfside-Sunset borrow site is known and it has been tested. Enviromental agencies has not requested any testing on placement areas. Contamination is present within the port and San Pedro Bay, but no excavation is required at the placement site. Sand and stone placement will cover or cap the seabed. Coordination with resource agency has occured with no anticipated HTRW concerns.**	Unlikely	Marginal	**Low**	Unlikely	Marginal	**Low**
39	09 - Environmental & Cultural/Historical Resources (EC)	**Coatal Commission Approval**	**Project in a Coastal Zone. The COE has to obtain the approval from the Coastal Commission.**	**Approval was received from the Coastal Commission.**	Unlikely	Negligible	**Low**	Unlikely	Negligible	**Low**

40	09 - Environmental & Cultural/Historical Resources (EC)	**Endangered Species Monitoring**	**Marine mammal monitoring is required.**	**No additional potential scope change is anticipated beyond sea turtle and marine mammal monitoring which is captured in the baseline cost estimate.**	Unlikely	Negligible	**Low**	Unlikely	Negligible	**Low**
41	27 - Construction Risks (CR)	**Unusual Wave Action / Downtime**	**Concerns of weather effects on rock placement and sand placement. Unusual wave action and downtime related to derrick barge and clamshell dredge.**	**The vast majority of work takes place within the harbor and it is sheltered from wave action by the breakwaters. Transportation of stone from Catalina Island to placement site may be occasionally affected by weather. Cost risk is seen as marginal since contracts carry an allowance for weather delays. Total project schedule is**	Likely	Marginal	**Medium**	Unlikely	Moderate	**Low**
42	06 - Planning-Site (PS)	**Unidentified Utilities**	**Texaco, Humble, Union Mobile, and Shell Islands (THUMs islands) utilities are identified. Encountering additions utilities is not anticipated.**	**Engineering has identified utilities in the area. Cost and schedule risks are seens as low.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
43	22 - Construction (CO)	**Subcontractors availability**	**Impact of subcontractors availability**	**Eelgrass transplantion and surveys are subcontracted. Cost and schedule risks are seen as unlikely with a moderate impact since the SoCal region has a large pool of eelgrass tranplant, monitoring, and survey contractors.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
44	19 - Estimate and Schedule Risks (ES)	**Stone and Sand Placement Rates**	**Variability on placement production rates impact cost and schedule.**	**Unit costs are largely driven by assumed placement production rates. We have historical information on stone placement rates as the Los Angeles District regularly does the kind of work.**	Possible	Marginal	**Low**	Unlikely	Marginal	**Low**
45	19 - Estimate and Schedule Risks (ES)	**Surfside-Sunset Borrow Site suitability**	**Concern on material suitability from the identified borrow site.**	**The likelihood for the Surside-sunset borrow site availability and material of suitability is high. There is a low chance to need to use an additional borrow source.**	Likely	Negligible	**Low**	Unlikely	Marginal	**Low**
46	19 - Estimate and Schedule Risks (ES)	**Stone Pricing**	**Variations in stone pricing.**	**Reent quotes were obtained for armor and quarry stone. Material pricing for armor stone has recently increased. Pricing is much higher if an inland source is used. Pebbly Beach Quarry on Catalina Island is the only quarry in the area available for water-based transportation. Quantity of armor stone required is significantly more than typically the Pebbly Beach Quarry yields. Cost can be affected.**	Likely	Moderate	**Medium**	Unlikely	Negligible	**Low**

47	04 - External Risks (EX)	**Political Opposition/Threat of Lawsuits**	**City Council or Local interests Opposition could push schedule**	**There remains the possibility that political opposition could stop the project or any individual event. It could also create a delay in the activities as well. As of now, all issues are addressed. City council may not approve project or schedule. City council may provide pressure due to the 2028 Olympics or other factors. The PDT feels that the likelihood of future political issues arising is possible and experience a**	Possible	Marginal	**Low**	Possible	Marginal	**Low**
48	04 - External Risks (EX)	**Public / Boater Input**	**Boaters disagree with USACE assessment on level of impact to boaters. Potential impact to boaters**	**Risk of design changes due to boater impacts. Risk will be handled by USACE communicating risks to boaters. If impacts to boaters cannot be addressed, the project will not move forward. City supports USACE stance that boaters are not impacted. No design changes or impacts anticipated.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
49	04 - External Risks (EX)	**Stakeholder Input**	**Concern on design changes resulting from stakeholder input**	**If design changes significantly as part of stakeholder input, the project will require a supplemental IES / IER or potentially an LRR to address changes. Risk accounts for supplemental EIS/R labor and associated schedule risks. Significant design changes are unlikely to occur, therefore cost and schedule risks are unlikely.** **Also, risk is captured by 40-- Stakeholders Request Late Changes.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
50	04 - External Risks (EX)	**City Approval**	**City has to adopt EIR as part of CEQA**	**City Council may reject proposed EIR. Rejection at the City Council level would end the project. Cost and schedule risks are unlikely since the City currently supports the project at the City Manager level.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**
51	04 - External Risks (EX)	**2028 Olympic Games**	**2028 Olympic events will take place in East San Pedro Bay**	**Project schedule circumvents construction during calendar year 2028. Baseline schedule indicates construction finish of the first contract before the 2028 Olympic Games. No permanent infrastructure to be installed will affect project measures. Potential pre-olympic activities. Since no construction is anticipated during the 2028 Olympics, cost and schedule risks are considered unlikely.**	Unlikely	Moderate	**Low**	Unlikely	Moderate	**Low**

East San Pedro Bay Feasibility Study - NER Plan

Estimated by	Mark Cooke, PE / Juan Dominguez, PE
Designed by	USACE, Los Angeles District
Prepared by	USACE, Los Angeles District
Preparation Date	10/13/2021
Effective Date of Pricing	10/1/2020
Estimated Construction Time	Days

Designed by
USACE, Los Angeles District
Estimated by
Mark Cooke, PE / Juan Dominguez, PE
Prepared by
USACE, Los Angeles District

Design Document	Chief's Report
Document Date	11/1/2019
District	Los Angeles District
Contact	Juan Dominguez, 213-452-3737
Budget Year	2022
UOM System	Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost

Timeline/Currency

Preparation Date	10/13/2021
Escalation Date	10/1/2020
Eff. Pricing Date	10/1/2020
Estimated Duration	0 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB16EN: 2016 MII English Cost Book

Labor 01LA21: Los Angeles, San Bernardino and Riverside Counties 2021

ates. Fringes paid to the laborers may be fully or partially taxable. In a NON-UNION job, all the fringe benefits are taxable. In a UNION job, the vacation pay fringes is taxable an

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP20R07: MII Equipment 2020 Region 07

Region 07 - WEST, (2020)

Sales Tax	8.10
Working Hours per Year	1,560
Labor Adjustment Factor	1.14
Cost of Money	1.13
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.110
Gas	2.680
Diesel Off-Road	2.640
Diesel On-Road	3.180

Shipping Rates

Over 0 CWT	30.76
Over 240 CWT	25.10
Over 300 CWT	21.68
Over 400 CWT	19.27
Over 500 CWT	28.34
Over 700 CWT	24.29
Over 800 CWT	13.61

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
Project Summary (Level1) Report			**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
1 East San Pedro Bay, Ecosystem Restoration	**1.00**	**LS**	**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
Project Summary (Level2) Report			**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
1 East San Pedro Bay, Ecosystem Restoration	**1.00**	**LS**	**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
			426,308.67	*469,186.84*	*474,800.66*	*609,266.58*
1.1 Kelp Reefs (12 locations) ** Representative for Contracts #1 (Near Long Beach Breakwater) and Contract #7 (Open-water) **	**12.00**	**EA**	**5,115,704**	**5,630,242**	**5,697,608**	**7,311,199**
			7,769,117.35	*8,577,346.30*	*8,709,203.81*	*11,175,693.88*
1.2 Nearshore Rocky Reefs (3 locations) ** Representative for Contracts #2 and #3 **	**3.00**	**EA**	**23,307,352**	**25,732,039**	**26,127,611**	**33,527,082**
			20,340,792.21	*22,413,106.37*	*22,707,204.38*	*29,137,998.19*
1.3 Open-Water Rocky Reef (1 location) ** Representative for Contracts #5 and #6 **	**1.00**	**EA**	**20,340,792**	**22,413,106**	**22,707,204**	**29,137,998**
			450,274.40	*481,483.06*	*517,564.14*	*664,140.89*
1.4 Nearshore - Eelgrass Beds (6 locations) ** Representative for Contract #4 **	**6.00**	**EA**	**2,701,646**	**2,888,898**	**3,105,385**	**3,984,845**

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
Project Summary (Level3) Report			**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
1 East San Pedro Bay, Ecosystem Restoration	**1.00**	**LS**	**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
1.1 Kelp Reefs (12 locations) ** Representative for Contracts #1 (Near Long Beach Breakwater) and Contract #7 (Open-water) **	**12.00**	**EA**	*426,308.67* **5,115,704**	*469,186.84* **5,630,242**	*474,800.66* **5,697,608**	*609,266.58* **7,311,199**
1.1.1 Kelp Reefs Construction (12 locations)	**61.00**	**ACR**	*83,864.00* **5,115,704**	*92,299.05* **5,630,242**	*93,403.41* **5,697,608**	*119,855.72* **7,311,199**
1.2 Nearshore Rocky Reefs (3 locations) ** Representative for Contracts #2 and #3 **	**3.00**	**EA**	*7,769,117.35* **23,307,352**	*8,577,346.30* **25,732,039**	*8,709,203.81* **26,127,611**	*11,175,693.88* **33,527,082**
1.2.1 Mob/Demob	**1.00**	**LS**	**798,607**	**874,645**	**874,645**	**1,122,349**
1.2.2 Rocky Reef Shoals (3 locations)	**3.00**	**EA**	*7,422,463.45* **22,267,390**	*8,180,483.76* **24,541,451**	*8,186,116.15* **24,558,348**	*10,504,465.18* **31,513,396**
1.2.3 Pre-survey area to determine Eelgrass density (1 visit)	**20.00**	**HR**	*288.13* **5,763**	*380.42* **7,608**	*497.14* **9,943**	*637.93* **12,759**
1.2.4 Post-survey Eelgrass areas (2 visits)	**40.00**	**HR**	*288.13* **11,525**	*380.42* **15,217**	*497.14* **19,885**	*637.93* **25,517**
1.2.5 Marine Mammal Monitoring During Construction	**19.00**	**MO**	*11,792.98* **224,067**	*15,427.22* **293,117**	*34,988.93* **664,790**	*44,897.97* **853,061**
1.3 Open-Water Rocky Reef (1 location) ** Representative for Contracts #5 and #6 **	**1.00**	**EA**	*20,340,792.21* **20,340,792**	*22,413,106.37* **22,413,106**	*22,707,204.38* **22,707,204**	*29,137,998.19* **29,137,998**
1.3.1 Mob/Demob	**1.00**	**LS**	**740,986**	**806,782**	**806,782**	**1,035,266**
1.3.2 Rocky Reef Shoals (1 location)	**1.00**	**EA**	*19,432,072.48* **19,432,072**	*21,387,712.08* **21,387,712**	*21,404,609.27* **21,404,609**	*27,466,501.63* **27,466,502**
1.3.3 Marine Mammal Monitoring During Construction	**14.00**	**MO**	*11,980.95* **167,733**	*15,615.19* **218,613**	*35,415.25* **495,813**	*45,445.02* **636,230**
1.4 Nearshore - Eelgrass Beds (6 locations) ** Representative for Contract #4 **	**6.00**	**EA**	*450,274.40* **2,701,646**	*481,483.06* **2,888,898**	*517,564.14* **3,105,385**	*664,140.89* **3,984,845**
1.4.1 Sand Placement from Surfside/Sunset Borrow Area -- Dredging	**1.00**	**LS**	**2,317,400**	**2,332,739**	**2,378,595**	**3,052,225**
1.4.2 Eelgrass Transplant (6 locations)	**7.50**	**ACR**	*51,232.85* **384,246**	*74,154.63* **556,160**	*96,905.27* **726,790**	*124,349.33* **932,620**

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
Project Summary (Level4) Report			**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
1 East San Pedro Bay, Ecosystem Restoration	**1.00**	**LS**	**51,465,495**	**56,664,286**	**57,637,809**	**73,961,124**
			426,308.67	*469,186.84*	*474,800.66*	*609,266.58*
1.1 Kelp Reefs (12 locations) ** Representative for Contracts #1 (Near Long Beach Breakwater) and Contract #7 (Open-water) **	**12.00**	**EA**	**5,115,704**	**5,630,242**	**5,697,608**	**7,311,199**
			83,864.00	*92,299.05*	*93,403.41*	*119,855.72*
1.1.1 Kelp Reefs Construction (12 locations)	**61.00**	**ACR**	**5,115,704**	**5,630,242**	**5,697,608**	**7,311,199**
1.1.1.1 Mob/Demob	**1.00**	**LS**	**686,764**	**736,411**	**736,411**	**944,967**
			65.66	*72.41*	*72.41*	*92.91*
1.1.1.2 Stone Placement in windrows on the sea floor	**66,000.00**	**TON**	**4,333,561**	**4,778,837**	**4,778,837**	**6,132,227**
1.1.1.3 Survey boulder deposition -- Prior, During and Post Construction	**1.00**	**LS**	**62,846**	**75,192**	**92,089**	**118,170**
			16,266.67	*19,900.90*	*45,135.25*	*57,917.77*
1.1.1.4 Marine Mammal Monitoring During Construction	**2.00**	**MO**	**32,533**	**39,802**	**90,270**	**115,836**
			7,769,117.35	*8,577,346.30*	*8,709,203.81*	*11,175,693.88*
1.2 Nearshore Rocky Reefs (3 locations) ** Representative for Contracts #2 and #3 **	**3.00**	**EA**	**23,307,352**	**25,732,039**	**26,127,611**	**33,527,082**
1.2.1 Mob/Demob	**1.00**	**LS**	**798,607**	**874,645**	**874,645**	**1,122,349**
1.2.1.1 Mob/Demob Crane to San Pedro Bay work site	**1.00**	**LS**	**100,000**	**100,000**	**100,000**	**128,321**
			2,228.51	*2,443.83*	*2,443.83*	*3,135.93*
1.2.1.2 Crane Setup	**80.00**	**HR**	**178,281**	**195,506**	**195,506**	**250,874**
1.2.1.3 Transfer TO San Pedro Bay work site	**1.00**	**LS**	**53,484**	**58,652**	**58,652**	**75,262**
1.2.1.4 Transfer FROM San Pedro Bay work site	**1.00**	**LS**	**53,484**	**58,652**	**58,652**	**75,262**
1.2.1.5 Crane Disassemble/Prepare for storage	**1.00**	**LS**	**53,484**	**58,652**	**58,652**	**75,262**
1.2.1.6 Test Crane	**1.00**	**LS**	**17,828**	**19,551**	**19,551**	**25,087**
1.2.1.7 Allowance for Tug Boat, tender, miscll equipment mob/demob	**1.00**	**LS**	**50,000**	**50,000**	**50,000**	**64,160**
1.2.1.8 Relocate personnel to jobsite	**1.00**	**LS**	**32,000**	**32,000**	**32,000**	**41,063**
			2,228.51	*2,443.83*	*2,443.83*	*3,135.93*
1.2.1.9 Relocation of derrick and marine crew within project boundaries. Within the project site relocating 3 times	**12.00**	**HR**	**26,742**	**29,326**	**29,326**	**37,631**
1.2.1.10 Furnish Boat Access	**1.00**	**LS**	**201,674**	**237,522**	**237,522**	**304,790**

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
			25,000.00	*25,000.00*	*25,000.00*	*32,080.13*
1.2.1.11 Permits: Air Quality	**1.00**	**EA**	**25,000**	**25,000**	**25,000**	**32,080**
1.2.1.12 As-Builts: on-going and final	**1.00**	**LS**	**6,629**	**9,785**	**9,785**	**12,556**
			7,422,463.45	*8,180,483.76*	*8,186,116.15*	*10,504,465.18*
1.2.2 Rocky Reef Shoals (3 locations)	**3.00**	**EA**	**22,267,390**	**24,541,451**	**24,558,348**	**31,513,396**
1.2.2.1 Establish boundaries and anchor points	**1.00**	**LS**	**133,711**	**146,630**	**146,630**	**188,156**
			170.19	*187.18*	*187.18*	*240.19*
1.2.2.2 Armor Stone Placement (7-Ton Stone)	**88,000.00**	**TON**	**14,976,846**	**16,472,021**	**16,472,021**	**21,136,979**
			110.79	*121.98*	*121.98*	*156.52*
1.2.2.3 Filter Stone Placement (1-Ton Stone)	**27,500.00**	**TON**	**3,046,773**	**3,354,379**	**3,354,379**	**4,304,356**
			60.41	*67.06*	*67.06*	*86.06*
1.2.2.4 Core Stone Placement (Quarry Run, 100 lbs to 1,000 lbs; 1/4 ton average)	**67,000.00**	**TON**	**4,047,215**	**4,493,230**	**4,493,230**	**5,765,735**
1.2.2.5 Survey boulder deposition -- Prior, During and Post Construction	**1.00**	**LS**	**62,846**	**75,192**	**92,089**	**118,170**
			288.13	*380.42*	*497.14*	*637.93*
1.2.3 Pre-survey area to determine Eelgrass density (1 visit)	**20.00**	**HR**	**5,763**	**7,608**	**9,943**	**12,759**
			187.87	*239.07*	*312.42*	*400.90*
1.2.3.1 Main crew boat	**20.00**	**HR**	**3,757**	**4,781**	**6,248**	**8,018**
			100.26	*141.35*	*184.72*	*237.03*
1.2.3.2 Diving team	**20.00**	**HR**	**2,005**	**2,827**	**3,694**	**4,741**
			288.13	*380.42*	*497.14*	*637.93*
1.2.4 Post-survey Eelgrass areas (2 visits)	**40.00**	**HR**	**11,525**	**15,217**	**19,885**	**25,517**
			187.87	*239.07*	*312.42*	*400.90*
1.2.4.1 Main crew boat	**40.00**	**HR**	**7,515**	**9,563**	**12,497**	**16,036**
			100.26	*141.35*	*184.72*	*237.03*
1.2.4.2 Diving team	**40.00**	**HR**	**4,010**	**5,654**	**7,389**	**9,481**
			11,792.98	*15,427.22*	*34,988.93*	*44,897.97*
1.2.5 Marine Mammal Monitoring During Construction	**19.00**	**MO**	**224,067**	**293,117**	**664,790**	**853,061**
			20,340,792.21	*22,413,106.37*	*22,707,204.38*	*29,137,998.19*
1.3 Open-Water Rocky Reef (1 location) ** Representative for Contracts #5 and #6 **	**1.00**	**EA**	**20,340,792**	**22,413,106**	**22,707,204**	**29,137,998**
1.3.1 Mob/Demob	**1.00**	**LS**	**740,986**	**806,782**	**806,782**	**1,035,266**
1.3.1.1 Mob/Demob Crane to San Pedro Bay work site	**1.00**	**LS**	**100,000**	**100,000**	**100,000**	**128,321**

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
			2,228.51	*2,443.83*	*2,443.83*	*3,135.93*
1.3.1.2 Crane Setup	**80.00**	**HR**	**178,281**	**195,506**	**195,506**	**250,874**
1.3.1.3 Transfer TO San Pedro Bay work site	**1.00**	**LS**	**53,484**	**58,652**	**58,652**	**75,262**
1.3.1.4 Transfer FROM San Pedro Bay work site	**1.00**	**LS**	**53,484**	**58,652**	**58,652**	**75,262**
1.3.1.5 Crane Disassemble/Prepare for storage	**1.00**	**LS**	**53,484**	**58,652**	**58,652**	**75,262**
1.3.1.6 Test Crane	**1.00**	**LS**	**17,828**	**19,551**	**19,551**	**25,087**
1.3.1.7 Allowance for Tug Boat, tender, miscll equipment mob/demob	**1.00**	**LS**	**50,000**	**50,000**	**50,000**	**64,160**
1.3.1.8 Relocate personnel to jobsite	**1.00**	**LS**	**32,000**	**32,000**	**32,000**	**41,063**
			2,228.51	*2,443.83*	*2,443.83*	*3,135.93*
1.3.1.9 Relocation of derrick and marine crew within project boundaries. Within the project site relocating 3 times	**12.00**	**HR**	**26,742**	**29,326**	**29,326**	**37,631**
1.3.1.10 Furnish Boat Access	**1.00**	**LS**	**144,053**	**169,659**	**169,659**	**217,707**
			25,000.00	*25,000.00*	*25,000.00*	*32,080.13*
1.3.1.11 Permits: Air Quality	**1.00**	**EA**	**25,000**	**25,000**	**25,000**	**32,080**
1.3.1.12 As-Builts: on-going and final	**1.00**	**LS**	**6,629**	**9,785**	**9,785**	**12,556**
			19,432,072.48	*21,387,712.08*	*21,404,609.27*	*27,466,501.63*
1.3.2 Rocky Reef Shoals (1 location)	**1.00**	**EA**	**19,432,072**	**21,387,712**	**21,404,609**	**27,466,502**
1.3.2.1 Establish boundaries and anchor points	**1.00**	**LS**	**133,711**	**146,630**	**146,630**	**188,156**
			210.22	*231.32*	*231.32*	*296.83*
1.3.2.2 Armor Stone Placement (10-Ton Stone)	**91,500.00**	**TON**	**19,235,516**	**21,165,890**	**21,165,890**	**27,160,176**
1.3.2.3 Survey boulder deposition -- Prior, During and Post Construction	**1.00**	**LS**	**62,846**	**75,192**	**92,089**	**118,170**
			11,980.95	*15,615.19*	*35,415.25*	*45,445.02*
1.3.3 Marine Mammal Monitoring During Construction	**14.00**	**MO**	**167,733**	**218,613**	**495,813**	**636,230**
			450,274.40	*481,483.06*	*517,564.14*	*664,140.89*
1.4 Nearshore - Eelgrass Beds (6 locations) ** Representative for Contract #4 **	**6.00**	**EA**	**2,701,646**	**2,888,898**	**3,105,385**	**3,984,845**
1.4.1 Sand Placement from Surfside/Sunset Borrow Area -- Dredging	**1.00**	**LS**	**2,317,400**	**2,332,739**	**2,378,595**	**3,052,225**
1.4.1.1 Mob/Demob (CEDEP)	**1.00**	**LS**	**554,285**	**554,285**	**554,285**	**711,261**
			17.07	*17.07*	*17.07*	*21.90*
1.4.1.2 Dredge Surfside/Sunset - 10 CY Clamshell (CEDEP) - Placement at San Pedro Bay site - Duration = 1 month (Ref. CEDEP, OT included in CEDEP)	**100,000.00**	**CY**	**1,707,000**	**1,707,000**	**1,707,000**	**2,190,431**

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ProjectCost
1.4.1.3 Construction Pre-Dredge and Post-Dredge Eelgrass Survey at Dredge Area Site	**1.00**	**LS**	**34,848**	**46,553**	**60,835**	**78,064**
			21,266.67	*24,900.90*	*56,475.25*	*72,469.32*
1.4.1.4 Marine Mammal Monitoring During Dredging Construction	**1.00**	**MO**	**21,267**	**24,901**	**56,475**	**72,469**
			51,232.85	*74,154.63*	*96,905.27*	*124,349.33*
1.4.2 Eelgrass Transplant (6 locations)	**7.50**	**ACR**	**384,246**	**556,160**	**726,790**	**932,620**
			288.13	*380.42*	*497.14*	*637.93*
1.4.2.1 Pre-survey area to determine Eelgrass density (1 visit)	**20.00**	**HR**	**5,763**	**7,608**	**9,943**	**12,759**
			588.91	*867.12*	*1,133.15*	*1,454.07*
1.4.2.2 Diving teams (4 teams @ 2 divers/team)	**480.00**	**HR**	**282,676**	**416,218**	**543,914**	**697,953**
			175.59	*243.99*	*318.85*	*409.15*
1.4.2.3 Shore support crew (3 laborers)	**480.00**	**HR**	**84,283**	**117,116**	**153,048**	**196,392**
			288.13	*380.42*	*497.14*	*637.93*
1.4.2.4 Post-survey area to detemine eelgrass success (2 visits: 6 months and 12 months)	**40.00**	**HR**	**11,525**	**15,217**	**19,885**	**25,517**

Currency in US dollars

Description **Page**

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 104781

SPL – East San Pedro Bay Ecosystem Restoration

The East San Pedro Bay Ecosystem Restoration Study, as presented by Los Angeles District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of January 20, 2022, the Cost MCX certifies the estimated total project cost:

FY22 Project First Cost: $262,411,000
Fully Funded Amount: $361,219,000

Cost Certification assumes Efficient Implementation (Funding). It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal Participation.

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

Total Project Cost Summary

Project: East San Pedro Bay Ecosystem Restoration
Location: City of Long Beach, CA
District: SPL - Los Angeles District
POC: Juan Dominguez

P2: 104781
Report Type: Prepared for Chief's Report
Contingency Development: Crystall Ball
CWCCIS Issue: 9/30/2021

Authority: WRDA 2022
TPCS Preparation Date: 19-Jan-22
FY: 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2022									
						Effective Price Level Date: 1 Oct 2021									
WBS	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1 Oct 2020 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J				M	N	O
06	FISH & WILDLIFE FACILITIES	143,937	59,016	41%	202,953	0.0%	143,937	59,016	202,953		202,953	40.0%	201,457	82,601	284,058
	Sub Total	143,937	59,016	41%	202,953		143,937	59,016	202,953				201,457	82,601	284,058
01	LANDS AND DAMAGES	7,762	1,941	25%	9,703	0.0%	7,762	1,941	9,703		9,703	31.5%	10,209	2,552	12,761
	Sub Total	7,762	1,941	25%	9,703		7,762	1,941	9,703				10,209	2,552	12,761
30	PLANNING ENGINEERING & DESIGN	25,932	10,629	41%	36,561	0.0%	25,933	10,629	36,562		36,562	28.5%	33,325	13,654	46,979
	Sub Total	25,932	10,629	41%	36,561		25,933	10,629	36,562				33,325	13,654	46,979
31	CONSTRUCTION MANAGEMENT	9,355	3,836	41%	13,192	0.0%	9,355	3,838	13,193		13,193	32.0%	12,354	5,067	17,421
	Sub Total	9,355	3,836	41%	13,192		9,355	3,838	13,193				12,354	5,067	17,421
06	LOCAL SUPPORT FACILITIES, LSF	1,144	146	13%	1,290	0.0%	1,144	146	1,290		N/A	Not included in the Total Project Cost - Local Support Facilities, LSF			
	Sub Total	1,144	146	13%	1,290		1,144	146	1,290						
	PROJECT COST TOTAL:	188,131	75,568		**263,699**		188,131	75,570	**263,701**	0	**262,411**	37.0%	257,345	103,874	**361,219**

Digitally signed by COOKE.MARK.D [redacted]

CHIEF, A-E MANAGEMENT, COST AND VALUE ENGINEERING SECTION, Mark Cooke, P.E.

CHEUNG.DOLAND [redacted] Digitally signed by CHEUNG.DOLAND [redacted] Date: 2022.01.20 14:53:16 -08'00'

PROJECT MANAGEMENT, Doland Sheung, P.E.

Cheryl L. Connett Digitally signed by Cheryl L. Connett Date: 2022.01.20 16:24:41 -08'00'

CHIEF, REAL ESTATE, Cheryl Connett

LOVASZ.PAMELA.J. [redacted] Digitally signed by LOVASZ.PAMELA.J. [redacted] Date: 2022.01.21 08:49:54 -08'00'

CHIEF, ENGINEERING, Pamela J. Lovasz, P.E.

ESTIMATED FEDERAL COST:	63%	**226,498**
ESTIMATED NON-FEDERAL COST:	37%	**134,721**
ESTIMATED TOTAL PROJECT COST:		**361,219**
ECOSYSTEM RESTORATION FEATURES CONSTRUCTION COST:		284,058
PROJECT FIRST COST:		**262,411**
LOCAL SERVICE FACILITIES (LSF) FIRST COST:		1,290
LERRD FIRST COST:		9,703
PREVIOUS TPCS:		**N/A**
Dated:		N/A
O&M OUTSIDE OF TOTAL PROJECT COST:		**N/A**

**** CONTRACT COST SUMMARY ****

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***												
Contract:	**PED Phase: DM, Geotechnical Investigations, Updates**	Mii Estimate Prepared:		15 Oct 2021		Program Year (Budget EC):		2022						
LOCATION:	Long Beach, CA	Effective Price Level:		1 Oct 2021		Effective Price Level Date:		1 Oct 2021						
District:	SPL - Los Angeles District													
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES	0	0	0%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Activities	Total	0	0	0%	0		0	0	0			0	0	0
01	LANDS AND DAMAGES	-	-	0%	-	0.0%	0	0	0	-	0.0%	0	0	0
Lands and Damages	Total	0	0	0%	0		0	0	0			0	0	0
30	PRECONSTRUCTION ENGINEERING & DESIGN (PED)													
	Project Management	67	27	41%	94	0.0%	67	27	94	2024Q1	5.1%	70	28	98
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2024Q1	5.1%	60	24	84
	Engineering & Design	1,752	718	41%	2,470	0.0%	1,752	718	2,470	2024Q1	5.1%	1,841	754	2,595
	Reviews, ATRs, IEPRs, VE	467	191	41%	658	0.0%	467	191	658	2024Q1	5.1%	491	201	692
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2024Q1	5.1%	69	28	97
	Contracting	40	16	41%	56	0.0%	40	16	56	2024Q1	5.1%	42	17	59
	Engineering During Construction (EDC)	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	Adaptive Mgmt & Environmental Monitoring	31	13	41%	44	0.0%	31	13	44	2024Q1	5.1%	33	14	47
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	2,560	1,048	41%	3,608		2,560	1,048	3,608			2,694	1,102	3,796
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
0.0%	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
0.0%	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	0	0	0%	0		0	0	0			0	0	0
	PED Phase: DM, Geotechnical Investigations, Updates Total	2,560	1,048	41%	3,608		2,560	1,048	3,608			2,694	1,102	**3,796**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				2,345				2,345					2,467
35.0%	**NON-FEDERAL COSTS TOTALS:**				1,263				1,263					1,329

Contract Footnote: Preconstruction Engineering and Design (PED) Phase occuring before Construction General Phase

****** CONTRACT COST SUMMARY ******

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***												
Contract:	**Contract #1 - Near Long Beach Breakwater - Kelp Reefs Construction**	Mii Estimate Prepared:		15 Oct 2021		Program Year (Budget EC):		2022						
LOCATION:	Long Beach, CA	Effective Price Level:		1 Oct 2021		Effective Price Level Date:		1 Oct 2021						
District:	SPL - Los Angeles District													
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Reef Construction	7,311	2,998	41%	10,309	0.0%	7,311	2,998	10,309	2026Q1	13.1%	8,266	3,390	11,656
Construction Activities	Total	7,311	2,998	41%	10,309		7,311	2,998	10,309			8,266	3,390	11,656
01	LANDS AND DAMAGES	722	181	25%	903	0.0%	722	181	903	2026Q1	11.5%	805	201	1,006
Lands and Damages	Total	722	181	25%	903		722	181	903			805	201	1,006
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2025Q1	7.7%	72	29	101
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2025Q1	7.7%	61	25	86
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2025Q1	7.7%	1,245	510	1,755
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2025Q1	7.7%	503	207	710
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2025Q1	7.7%	71	29	100
	Contracting	40	16	41%	56	0.0%	40	16	56	2025Q1	7.7%	43	17	60
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	Adaptive Mgmt & Environmental Monitoring	1,464	600	41%	2,064	0.0%	1,464	600	2,064	2031Q1	25.2%	1,833	751	2,584
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	3,826	1,568	41%	5,394		3,826	1,568	5,394			4,390	1,798	6,188
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	475	195	41%	670	0.0%	475	195	670	2026Q1	10.4%	524	215	739
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	475	195	41%	670		475	195	670			524	215	739
06	Aids to Navigation, AToN	132	17	13%	149	0.0%	132	17	149	Not included in the Total Project Cost - Local Support Facilities, LSF - Coast Guard Expense				
LSF Construction Activities	Total	132	17	13%	149		132	17	149					
	Contract #1 - Near Long Beach Breakwater - Kelp Reefs Construction Total	12,466	4,958	40%	17,424		12,466	4,959	17,425			13,985	5,604	**19,589**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				10,642				10,642					12,079
35.0%	**NON-FEDERAL COSTS TOTALS:**				6,633				6,633					7,510
	LSF COSTS TOTALS:				149				149					

Contract Footnote: Contract consists of placing scattered 500 lbs rocks at 12 locations

****** CONTRACT COST SUMMARY ******

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***				(Constant Dollar Basis)								
Contract: **Contract #2 - Nearshore - Rocky Reefs**		Mii Estimate Prepared: 15 Oct 2021				Program Year (Budget EC): 2022								
LOCATION: Long Beach, CA		Effective Price Level: 1 Oct 2021				Effective Price Level Date: 1 Oct 2021								
District: SPL - Los Angeles District														
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Reef Construction	33,527	13,746	41%	47,273	0.0%	33,527	13,746	47,273	2029Q1	23.9%	41,544	17,033	58,577
Construction Activities	Total	33,527	13,746	41%	47,273		33,527	13,746	47,273			41,544	17,033	58,577
01	LANDS AND DAMAGES	1,399	350	25%	1,749	0.0%	1,399	350	1,749	2029Q1	20.1%	1,680	420	2,100
Lands and Damages	Total	1,399	350	25%	1,749		1,399	350	1,749			1,680	420	2,100
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2027Q1	13.1%	76	31	107
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2027Q1	13.1%	64	26	90
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2027Q1	13.1%	1,308	536	1,844
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2027Q1	13.1%	528	217	745
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2027Q1	13.1%	75	31	106
	Contracting	40	16	41%	56	0.0%	40	16	56	2027Q1	13.1%	45	18	63
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	3D Basin Study (LSTF) - ERDC Model	1,000	410	41%	1,410	0.0%	1,000	410	1,410	2027Q1	13.1%	1,131	464	1,595
	Adaptive Mgmt & Environmental Monitoring	331	136	41%	467	0.0%	331	136	467	2034Q1	35.6%	449	184	633
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	3,693	1,514	41%	5,207		3,693	1,514	5,207			4,238	1,737	5,975
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	2,179	894	41%	3,073	0.0%	2,179	894	3,073	2029Q1	19.0%	2,592	1,063	3,655
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	2,179	894	41%	3,073		2,179	894	3,073			2,592	1,063	3,655
06	Aids to Navigation, AToN	462	58	13%	520	0.0%	462	58	520	Not included in the Total Project Cost - Local Support Facilities, LSF - Coast Guard Expense				
LSF Construction Activities	Total	462	58	13%	520		462	58	520					
	Contract #2 - Nearshore - Rocky Reefs Total	41,260	16,561	40%	57,821		41,260	16,562	57,822			50,054	20,253	**70,307**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				36,109				36,109					44,335
35.0%	**NON-FEDERAL COSTS TOTALS:**				21,192				21,192					25,972
	LSF COSTS TOTALS:				520				520					

Contract Footnote: Contract involves strategically placing armor, core, and filter stones at 3 locations

****** CONTRACT COST SUMMARY ******

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***												
Contract:	**Contract #3 - Nearshore - Rocky Reefs**	Mii Estimate Prepared:		15 Oct 2021		Program Year (Budget EC):		2022						
LOCATION:	Long Beach, CA	Effective Price Level:		1 Oct 2021		Effective Price Level Date:		1 Oct 2021						
District:	SPL - Los Angeles District													
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Reef Construction	33,527	13,746	41%	47,273	0.0%	33,527	13,746	47,273	2032Q1	35.8%	45,529	18,667	64,196
Construction Activities	Total	33,527	13,746	41%	47,273		33,527	13,746	47,273			45,529	18,667	64,196
01	LANDS AND DAMAGES	1,399	350	25%	1,749	0.0%	1,399	350	1,749	2032Q1	28.7%	1,800	450	2,250
Lands and Damages	Total	1,399	350	25%	1,749		1,399	350	1,749			1,800	450	2,250
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2030Q1	22.0%	82	33	115
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2030Q1	22.0%	70	28	98
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2030Q1	22.0%	1,411	579	1,990
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2030Q1	22.0%	570	234	804
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2030Q1	22.0%	81	33	114
	Contracting	40	16	41%	56	0.0%	40	16	56	2030Q1	22.0%	49	20	69
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2030Q1	22.0%	98	40	138
	Adaptive Mgmt & Environmental Monitoring	331	136	41%	467	0.0%	331	136	467	2037Q1	47.0%	487	200	687
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	2,693	1,104	41%	3,797		2,693	1,104	3,797			3,322	1,361	4,683
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	2,179	894	41%	3,073	0.0%	2,179	894	3,073	2032Q1	28.6%	2,802	1,149	3,951
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	2,179	894	41%	3,073		2,179	894	3,073			2,802	1,149	3,951
06	Aids to Navigation, AToN	330	42	13%	372	0.0%	330	42	372	Not included in the Total Project Cost - Local Support Facilities, LSF - Coast Guard Expense				
LSF Construction Activities	Total	330	42	13%	372		330	42	372					
	Contract #3 - Nearshore - Rocky Reefs Total	40,128	16,135	40%	56,263		40,128	16,136	56,264			53,453	21,627	**75,080**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				35,193				35,193					47,340
35.0%	**NON-FEDERAL COSTS TOTALS:**				20,699				20,699					27,741
	LSF COSTS TOTALS:				372				372					

Contract Footnote: Contract involves strategically placing armor, core, and filter stones at 3 locations

**** CONTRACT COST SUMMARY ****

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***												
Contract: **Contract #4 - Nearshore - Eelgrass Beds**		Mii Estimate Prepared: 15 Oct 2021				Program Year (Budget EC): 2022								
LOCATION: Long Beach, CA		Effective Price Level: 1 Oct 2021				Effective Price Level Date: 1 Oct 2021								
District: SPL - Los Angeles District														
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Eelgrass Beds	3,985	1,634	41%	5,619	0.0%	3,985	1,634	5,619	2034Q1	44.3%	5,752	2,359	8,111
Construction Activities	Total	3,985	1,634	41%	5,619		3,985	1,634	5,619			5,752	2,359	8,111
01	LANDS AND DAMAGES	722	181	25%	903	0.0%	722	181	903	2034Q1	34.4%	970	243	1,213
Lands and Damages	Total	722	181	25%	903		722	181	903			970	243	1,213
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2032Q1	28.6%	86	35	121
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2032Q1	28.6%	73	30	103
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2032Q1	28.6%	1,486	609	2,095
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2032Q1	28.6%	600	247	847
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2032Q1	28.6%	85	35	120
	Contracting	40	16	41%	56	0.0%	40	16	56	2032Q1	28.6%	51	21	72
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	Adaptive Mgmt & Environmental Monitoring	1,587	651	41%	2,238	0.0%	1,587	651	2,238	2039Q1	55.3%	2,465	1,011	3,476
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	3,949	1,619	41%	5,568		3,949	1,619	5,568			5,408	2,218	7,626
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	259	106	41%	365	0.0%	259	106	365	2034Q1	35.6%	351	144	495
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	259	106	41%	365		259	106	365			351	144	495
	Contract #4 - Nearshore - Eelgrass Beds Total	8,915	3,540	40%	12,455		8,915	3,540	12,455			12,481	4,964	**17,445**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				7,509				7,509					10,551
35.0%	**NON-FEDERAL COSTS TOTALS:**				4,946				4,946					6,894

Contract Footnote: ***Contract consists on building eelgrass beds to functions as habitat and nursery areas for marine life at 6 locations.***

****** CONTRACT COST SUMMARY ******

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***												
Contract: **Contract #5 - Open Water - Rocky Reef**		Mii Estimate Prepared: 15 Oct 2021				Program Year (Budget EC): 2022								
LOCATION: Long Beach, CA		Effective Price Level: 1 Oct 2021				Effective Price Level Date: 1 Oct 2021								
District: SPL - Los Angeles District														
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Reef Construction	29,138	11,947	41%	41,085	0.0%	29,138	11,947	41,085	2035Q1	48.8%	43,364	17,780	61,144
Construction Activities	Total	29,138	11,947	41%	41,085		29,138	11,947	41,085			43,364	17,780	61,144
01	LANDS AND DAMAGES	1,399	350	25%	1,749	0.0%	1,399	350	1,749	2035Q1	37.3%	1,920	480	2,400
Lands and Damages	Total	1,399	350	25%	1,749		1,399	350	1,749			1,920	480	2,400
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2034Q1	35.6%	91	37	128
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2034Q1	35.6%	77	31	108
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2034Q1	35.6%	1,568	643	2,211
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2034Q1	35.6%	633	260	893
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2034Q1	35.6%	90	37	127
	Contracting	40	16	41%	56	0.0%	40	16	56	2034Q1	35.6%	54	22	76
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	Adaptive Mgmt & Environmental Monitoring	331	136	41%	467	0.0%	331	136	467	2040Q1	59.7%	529	217	746
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	2,693	1,104	41%	3,797		2,693	1,104	3,797			3,604	1,477	5,081
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	1,894	777	41%	2,671	0.0%	1,894	777	2,671	2035Q1	39.3%	2,638	1,082	3,720
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	1,894	777	41%	2,671		1,894	777	2,671			2,638	1,082	3,720
06	Aids to Navigation, AToN	44	6	14%	50	0.0%	44	6	50	Not included in the Total Project Cost - Local Support Facilities, LSF - Coast Guard Expense				
LSF Construction Activities	Total	44	6	14%	50		44	6	50					
	Contract #5 - Open Water - Rocky Reef Total	35,168	14,183	40%	49,351		35,168	14,184	49,352			51,526	20,819	**72,345**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				30,909				30,909					45,464
35.0%	**NON-FEDERAL COSTS TOTALS:**				18,392				18,392					26,881
	LSF COSTS TOTALS:				50				50					

Contract Footnote: Contract involves strategically placing 10-Ton armor stones at 1 location

****** CONTRACT COST SUMMARY ******

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST				PROJECT FIRST COST				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Class Level: ***Class 3***				(Constant Dollar Basis)								
Contract: **Contract #6 - Open Water - Rocky Reef**		Mii Estimate Prepared: 15 Oct 2021				Program Year (Budget EC): 2022								
LOCATION: Long Beach, CA		Effective Price Level: 1 Oct 2021				Effective Price Level Date: 1 Oct 2021								
District: SPL - Los Angeles District														
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Reef Construction	29,138	11,947	41%	41,085	0.0%	29,138	11,947	41,085	2036Q1	53.4%	44,708	18,331	63,039
Construction Activities	Total	29,138	11,947	41%	41,085		29,138	11,947	41,085			44,708	18,331	63,039
01	LANDS AND DAMAGES	1,399	350	25%	1,749	0.0%	1,399	350	1,749	2036Q1	40.1%	1,960	490	2,450
Lands and Damages	Total	1,399	350	25%	1,749		1,399	350	1,749			1,960	490	2,450
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2035Q1	39.3%	93	38	131
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2035Q1	39.3%	79	32	111
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2035Q1	39.3%	1,610	660	2,270
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2035Q1	39.3%	650	267	917
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2035Q1	39.3%	92	38	130
	Contracting	40	16	41%	56	0.0%	40	16	56	2035Q1	39.3%	56	22	78
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	Adaptive Mgmt & Environmental Monitoring	331	136	41%	467	0.0%	331	136	467	2041Q1	64.3%	544	223	767
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	2,693	1,104	41%	3,797		2,693	1,104	3,797			3,686	1,510	5,196
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	1,894	777	41%	2,671	0.0%	1,894	777	2,671	2036Q1	43.0%	2,709	1,111	3,820
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	1,894	777	41%	2,671		1,894	777	2,671			2,709	1,111	3,820
06	Aids to Navigation, AToN	44	6	14%	50	0.0%	44	6	50	Not included in the Total Project Cost - Local Support Facilities, LSF - Coast Guard Expense				
LSF Construction Activities	Total	44	6	14%	50		44	6	50					
	Contract #6 - Open Water - Rocky Reef Total	35,168	14,183	40%	49,351		35,168	14,184	49,352			53,063	21,442	**74,505**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				30,909				30,909					46,836
35.0%	**NON-FEDERAL COSTS TOTALS:**				18,392				18,392					27,669
	LSF COSTS TOTALS:				50				50					

Contract Footnote: Contract involves strategically placing 10-Ton armor stones at 1 location

****** CONTRACT COST SUMMARY ******

PROJECT: East San Pedro Bay Ecosystem Restoration
LOCATION: City of Long Beach, CA
This estimate reflects the scope and schedule in the Integrated Feasibility Report

DISTRICT: Los Angeles District
POC: Juan Dominguez, PE, CCE

PREPARED: January 19, 2022

WBS STRUCTURE		ESTIMATED COST Estimate Class Level: ***Class 3***				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
Contract: **Contract #7 - Open Water - Kelp Reefs Construction** LOCATION: Long Beach, CA District: SPL - Los Angeles District		Mii Estimate Prepared: 15 Oct 2021 Effective Price Level: 1 Oct 2021				Program Year (Budget EC): 2022 Effective Price Level Date: 1 Oct 2021								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES - Reef Construction	7,311	2,998	41%	10,309	0.0%	7,311	2,998	10,309	2039Q1	68.2%	12,294	5,041	17,335
Construction Activities	Total	7,311	2,998	41%	10,309		7,311	2,998	10,309			12,294	5,041	17,335
01	LANDS AND DAMAGES	722	181	25%	903	0.0%	722	181	903	2039Q1	48.7%	1,074	268	1,342
Lands and Damages	Total	722	181	25%	903		722	181	903			1,074	268	1,342
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	67	27	41%	94	0.0%	67	27	94	2038Q1	51.1%	101	41	142
	Planning & Environmental Compliance	57	23	41%	80	0.0%	57	23	80	2038Q1	51.1%	86	35	121
	Engineering & Design	1,156	474	41%	1,630	0.0%	1,156	474	1,630	2038Q1	51.1%	1,747	716	2,463
	Reviews, ATRs, IEPRs, VE	467	192	41%	659	0.0%	467	192	659	2038Q1	51.1%	706	290	996
	Life Cycle Updates (cost, schedule, risks)	66	27	41%	93	0.0%	66	27	93	2038Q1	51.1%	100	41	141
	Contracting	40	16	41%	56	0.0%	40	16	56	2038Q1	51.1%	60	24	84
	Engineering During Construction (EDC)	429	176	41%	605	0.0%	429	176	605	2026Q1	10.4%	474	194	668
	Real Estate & Planning During Construction	80	33	41%	113	0.0%	80	33	113	2026Q1	10.4%	88	36	124
	Adaptive Mgmt & Environmental Monitoring	1,464	600	41%	2,064	0.0%	1,464	600	2,064	2044Q1	79.0%	2,621	1,074	3,695
	Project Operation	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Planning Engineering and Design	Total	3,826	1,568	41%	5,394		3,826	1,568	5,394			5,983	2,451	8,434
31	CONSTRUCTION MANAGEMENT													
6.5%	Construction Management	475	195	41%	670	0.0%	475	195	670	2039Q1	55.3%	738	303	1,041
	Project Operation:	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
	Project Management	0	0	41%	0	0.0%	0	0	0	0	0.0%	0	0	0
Construction Management	Total	475	195	41%	670		475	195	670			738	303	1,041
06	Aids to Navigation, AToN	132	17	13%	149	0.0%	132	17	149	Not included in the Total Project Cost - Local Support Facilities, LSF - Coast Guard Expense				
LSF Construction Activities	Total	132	17	13%	149		132	17	149					
	Contract #7 - Open Water - Kelp Reefs Construction Total	12,466	4,958	40%	17,424		12,466	4,959	17,425			20,089	8,063	**28,152**
COST SPLIT														
65.0%	**FEDERAL COST TOTALS:**				10,642				10,642					17,427
35.0%	**NON-FEDERAL COSTS TOTALS:**				6,633				6,633					10,726
	LSF COSTS TOTALS:				149				149					

Contract Footnote: Contract consists of placing scattered 500 lbs rocks at 12 locations