Coastal Conservancy

March 12, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Section 1122 Proposal for San Francisco Bay

Dear Brigadier General Helmlinger,

The California State Coastal Conservancy (Conservancy) is pleased to submit the attached proposal, Resilient San Francisco Bay Project, for consideration as one of the ten selected projects in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act of 2016.

The Conservancy proposes to cost share a regional effort to use the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor, Pinole Shoal, and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at In-Bay disposal sites, the Corps and Conservancy would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, and Eden Landing, and also test new in-bay beneficial use sites that could potentially feed existing and restored wetlands in the future.

We believe this is a strong proposal with a high chance of success, given the availability of non-federal funds for cost-sharing; the inclusion of multiple beneficial use sites, including two that are already accepting dredged sediment and two that will be on-line within 2-3 years; a history in San Francisco Bay of successful wetlands restoration projects using dredged sediment; a significant level of support from site owners, ports, environmental groups, and regulatory agencies; and the Conservancy's experience cost-sharing projects with the Corps.

We look forward to working with the South Pacific Division and San Francisco District to make this project happen. The proposed project achieves multiple benefits, including aquatic ecosystem restoration, enhanced shoreline resilience and adaptation, and increased efficiencies in dredge material placement.

Please contact Amy Hutzel at 510-286-4180 or amy.hutzel@scc.ca.gov if there are any questions about this proposal.

Sincerely,

Sam Schuchat
Executive Officer

1515 Clay Street, 10th Floor
Oakland, California 94612-1401
510·286·1015 Fax: 510·286·0470

Water Resources and Development Act 2016
(Water Infrastructure Improvements for the Nation Act) Section 1122
Restoring San Francisco Bay's Natural Infrastructure with Dredged Sediment

1. **Proposed Project:** Restoring San Francisco Bay's Natural Infrastructure with Dredged Sediment **(Resilient San Francisco Bay Project)**

   Location: Within the Oakland, Redwood City, Richmond, and Pinole federal navigation channels, and at Cullinan Ranch, Montezuma, Bel Marin Keys and Eden Landing Wetland Restoration Projects, in San Francisco Bay, California

   Contact: Ms. Amy Hutzel
   California State Coastal Conservancy
   1515 Clay Street, 10th Floor
   Oakland, CA 94612
   (510)286-1015
   amy.hutzel@scc.ca.gov

2. **Project Purpose**. The primary purpose of the Resilient San Francisco Bay Project will be to use valuable sediment dredged from four federal navigation channels to restore and create aquatic ecosystem habitats at four tidal wetland restoration sites. Secondary benefits from the project include reducing the risk of storm damage to infrastructure, including highways, roads, wastewater facilities, residential and commercial properties, as well as promoting outdoor recreation activities. This proposal also supports the development of an innovative strategy by the US Army Corps of Engineers (USACE) to enhance sediment delivery to tidal wetlands with the intent of increasing their ability to adapt and be resilient over time due to increased water levels and reduced suspended sediment in the Bay.

   San Francisco Bay has lost over eight-five percent of its wetlands through diking, dredging and development since the mid-1800s. A large partnership of Federal, State, and local agencies and organizations is currently on a path to restore 60,000 acres of tidal wetlands to add to the existing 40,000 acres and achieve a net total of 100,000 acres of lost natural infrastructure that helped protect the region from tidal flooding and storm damage. This Bay partnership has acquired lands, developed regional plans, and is implementing multiple projects to restore these critical tidal wetlands for both ecosystem benefits and shoreline protection. Sediment is key to addressing the historical subsidence that has occurred and sediment from dredging navigation channels is acknowledged as a resource that cannot be wasted. In a show of strong public support for these activities, the Bay Area voted in 2016 to tax themselves to fund $500 million over the next 20 years in efforts to accelerate wetlands restoration in light of rising seas and potential tidal flooding. The Resilient San Francisco Bay Project in its focus on protecting, restoring, and creating aquatic ecosystem habitats is intended to be a significant tool in the Bay partnership's effort to restore 60,000 acres of tidal wetlands in the Bay.

   San Francisco Bay is uniquely suited to implement a successful pilot project of this nature, in that it has:

   - Four deep water navigation channels that can provide 1.5 to 2.5 million cubic yards annually of valuable sediment necessary for the foundation for wetland protection, restoration and creation of four available restoration sites.

- Two restoration sites that are fully permitted and operational and receiving dredged sediment now.
- Two more restoration sites that are in final environmental review or permitting processes now and will come on-line in the next two to three years.

Much of sediment dredged from these federal navigation projects is currently disposed of at the Deep Ocean Disposal site, 50 miles outside of the Bay in the Pacific Ocean, or at dispersive in-Bay disposal sites, missing an opportunity to protect, restore and create aquatic ecosystem habitats, stabilize Bay shorelines, protect communities and infrastructure, restore estuarine ecosystems, support endangered species recovery, reducing USACE's costs in the aggregate by providing construction materials otherwise wasted, and provide adaptive capacity to the region. Our extensive experience with beneficial use has taught us that having multiple dredge sites feeding multiple restoration sites is the best way to avoid the timing problems we experienced between the Port of Oakland 50-foot Deepening Project and Hamilton Wetlands Restoration Project. We also believe that a multiplicity of dredge and restoration sites will allow for an increase in competition and thus bring down the cost of these projects over the long haul. We anticipate efficiencies in dredge contracting due to coordination of dredged material placement, ability to dredge outside the work windows, increased competition, and enhanced contractor understanding of long-term plans for dredged material placement plans and necessary equipment to fulfill these plans.

3. **Project Description**. The Resilient San Francisco Bay Project is designed to maximize the beneficial use of valuable dredged sediment from four federal deep draft navigation projects at four wetland restoration projects at subsided baylands (historic wetlands that were diked off from the Bay, and thus experienced deep subsidence over time) over a ten year period; and to examine the ability of tides and currents to move dredged sediment placed in the near shore environment to existing marshes, making them more resilient to rising waters. This project will restore 7,331 acres of tidal wetlands. Further, as an additional benefit, over 13 miles of shoreline will be stabilized, and improved coastal flood risk management would be provided to the Bel Marin Keys Community and the cities of Novato, Hayward, and Union City. Infrastructure adjacent to the projects includes one mile of Highway 37, the intersection of Highway 37 and Highway 101, approximately 50 miles of roads, the Union Sanitary District's wastewater facility that serves 347,000 residents, the outfall for Novato Sanitary District's wastewater facility that serves 60,000 residents, Pacific Gas and Electric high-power lines, commercial development, and over 11,500 residents in close to 3,000 households. Property and infrastructure immediately adjacent to the projects and within coastal flood zones (not including transportation infrastructure) is valued at approximately $2 billion.

   In the Bay Area, beneficial reuse of dredged sediment uses an "engineering with nature" approach, in that sediment is placed in subsided baylands raising site elevations to near marsh plain - supporting rapid development of tidal marsh vegetation and habitat. Subsided restoration sites that are breached without raising site elevations are projected to take 60 to 75 years to develop to tidal marsh, while projects using dredged sediment have been shown to develop in 10 to 15 years. This is critically important as restored marshes breached without sediment may miss a critical development period prior to significant and increasing rising sea level in the region. The restoration projects include restoration of hydrologic function and geomorphic processes and will be self-sustaining.

   The San Francisco Bay area has a long history of success in the beneficial use arena providing for the purpose of protecting, restoring and creating aquatic ecosystem habitats. The concept of direct beneficial use of dredged sediment was proven first with the Sonoma Baylands Wetland Restoration Project, a joint effort of USACE and the California State Coastal Conservancy (Conservancy), using

sediment dredged from the Oakland Harbor Federal 42-foot Deepening Project. USACE and Conservancy then partnered to construct the Hamilton Wetlands Restoration Project, built with sediment from the Oakland Harbor Federal 50-foot deepening project. The Oakland Harbor 50-foot Deepening also supported the first phase of the Montezuma Wetlands Restoration Project, which is due to breach in 2019. This proposal includes four aquatic ecosystem restoration projects that are ideally suited for beneficial use for the primary purpose of protecting, restoring and creating aquatic ecosystem habitats. Additional benefits of the proposal include storm damage reduction, and protecting public infrastructure. The restoration sites provide a mix of locations, capacity, and readiness, which would support navigation dredging in full compliance with state and federal agency law and policy.

In addition to supporting direct placement of dredged sediment in aquatic ecosystem restoration sites, the proposal includes a unique opportunity to develop innovative use and placement alternative aquatic placement technique to augment sediment supply to existing marshes over time. This concept – placing dredged sediment immediately adjacent to a tidal wetland needing sediment and using the tides and currents to move the sediment onto the marsh plain, dubbed "Strategic Placement," was developed over the past two years, including conceptual models and the design of a pilot program to inform potential efficacy of the concept. The Strategic Placement pilot would involve baseline and event monitoring, modeling site conditions, a tracer study, and placement of sediment at one location. The monitoring, tracer study and modeling will assist in determining the success of the pilot and may lead to a larger demonstration project. We believe that this innovative placement alternative will produce public economic and environmental benefits by using nature and the power of the tides and currents to move a portion of the sediment onto the marsh plain.

The specifics of the Resilient San Francisco Bay Project include the following:

Tidal Wetland Restoration Projects: Cullinan Ranch, Montezuma, Bel Marin Keys V, and Eden Landing Wetland Restoration Projects were specifically chosen for this proposal due to their primary focus of protecting, restoring, and creating aquatic ecosystem habitats, as well as secondary benefits, diversity of location, capacity, as well as readiness to receive sediment now and over time. These four projects together represent a commitment of over $153 million to restoring San Francisco Bay's wetland habitat, supporting endangered species recovery, as well as developing regional resilience to flooding and storm surge along the shoreline. Restoring tidal wetlands supports risk management adaptation strategies because vegetated marshes reduce wave fetch, allowing sediment to drop out of suspension, deposit on site, and increase site elevation over time increasing adaptive capacity. In addition to the ecosystem habitat restoration, each of these projects includes a recreational aspect, such as wildlife viewing, kayaking, fishing, hunting, and hiking.

a. **Cullinan Ranch Wetland Restoration Project (Cullinan Ranch)** The 1,575-acre Cullinan Ranch is owned by the US Fish and Wildlife Service (USFWS) as part of the San Pablo Bay National Wildlife Refuge, in Solano County in northern San Francisco Bay. The USFWS is restoring this site to historic tidal marsh conditions, increasing tidal marsh habitat for threatened and endangered species, as well as stabilizing the subsided shoreline behind a weak levee system. Approximately 300 acres of the site is specifically targeted for salt marsh harvest mouse (federally and state listed as endangered) and requires the placement of dredged sediment to reach appropriate elevations for pickleweed establishment. Once sediment has been received, salt marsh harvest mouse habitat is anticipated to develop on this site within 2-5 years.

   This site is currently designed and permitted to import approximately 2.8 million cubic yards (mcy) of dredged sediment via an offloading facility but is currently using contractor supplied

offloading equipment. The Richmond Inner Harbor project has successfully used this site for the past two dredging seasons. This site is also permitting for a multi-user offloader stationed at the confluence of the Napa River and Dutchman Slough, where deep draft vessels have access, allowing use of the full fleet of dredge scows in the region. We believe that by more intensively using this site we will see cost savings through completion and maturing of the practice.

In addition to restoring tidal wetlands for habitat and productivity, this site provides secondary benefits to the economy and the public. The southern property boundary is State Highway 37, a major thoroughfare connecting North and East Bay cities, industry and communities. The Cullinan Restoration Project included the construction of a significant levee to protect Highway 37 from tidal flooding and storm surge, making it more resilient and increasing public safety. This site provides recreational opportunities, including wildlife viewing areas, bird watching, fishing, a kayak launch ramp, and an informational kiosk about the project and site use.

Cullinan Ranch is fully permitted and operational, with the capacity to receive approximately 2 mcy of dredged sediment. Dredging contractors currently are required to provide their own offloading equipment for the site. Three of the five local dredging companies have provided equipment and have successfully used this site.

b. **Montezuma Wetlands Restoration Project (Montezuma).** Montezuma is privately owned and operated by Montezuma LLC. This subsided wetland restoration site is located at the eastern edge of Nationally-recognized Suisun Marsh. It is adjacent to Montezuma Slough near the town of Collinsville in Solano County. This site represents 12.6% of the Suisun Marsh and the entire region is low in the tidal frame with non-engineered levees providing limited protection from inundation and salt water intrusion into the Western Delta, threatening much of the State's fresh water infrastructure. In addition to restoring tidal wetlands for endangered species habitat, including least tern, salt marsh harvest mouse, Ridgway's Rail, Delta smelt, and salmon, as well as productive vegetation that will build organic sediment, this site is bordered on one side by upland habitat, which will allow for marsh transgression over time. Additional benefits of this site include improved water quality, local coastal flood risk reduction, recreation and open space opportunities for the public, and improved shoreline resilience. The site includes public facilities for fishing, wildlife viewing, and picnicking.

   Montezuma's design includes construction of an internal levee system with specific deep cells that can accept sediment with slightly elevated levels of contamination, making it unique among Bay Area restoration projects. It increases the region's capacity to maintain navigation channels and berthing areas that have elevated levels of contaminants, reducing costs for upland disposal at landfills. As permitted, this site can accept both "cover" and "foundation" quality sediment[1], "cover" sediment can be in direct contact with water and organisms, while "foundation" is buried deeper in the site in deep cells.

[1] There are two levels of screening guidelines for beneficial use of sediments for wetland restoration: guidelines for cover material; and guidelines for foundation material. Cover material is a class of material that is not expected to pose a threat to water quality or the aquatic environment, even in places where the material is in direct contact with surface waters or aquatic organisms, and is suitable for unconfined aquatic disposal. Wetland foundation material is not of a quality that constitutes a hazardous or listed waste but has a potential for biological effects if directly exposed to organisms. Wetland foundation material is not expected to be a threat to water quality when an adequate amount of cover material is used to reduce the risk of foundation material coming into contact with the aquatic environment.

At Montezuma, 17 mcy of dredged sediment are necessary to restore approximately 1,880 acres of tidal and seasonal wetlands. Approximately 6.5 mcy of dredged sediment has been placed to date as part of Phase 1 of the project. Phase 2 of the project, included in this proposal, has 4.5 mcy capacity. Additional phases could accept up to 6 mcy more sediment. The site has deep-water access for all classes of dredge scows, a docking area, and the Liberty (a high capacity offloader) on site. This project is fully permitted and operational.

c. **Bel Marin Keys Unit V (Bel Marin Keys) Expansion of Hamilton Wetland Restoration Project (Hamilton).** The roughly 960-acre Hamilton site owned by the Conservancy, is located in the City of Novato, Marin County, on the western shore of San Pablo Bay. Restoration of the former airfield, using sediment primarily from the Port of Oakland 50-foot Deepening Project, was completed by USACE in 2014 when the site was breached to the Bay. The adjacent Bel Marin Keys project (also owned by the Conservancy), authorized by the Water Resources Development Act of 2007, as an aquatic ecosystem restoration project, would expand Hamilton by 1,576 acres, creating nearly 2,600 acres of contiguous restored wetlands. Bel Marin Keys was converted from salt marsh habitat to agricultural use over the past 150 years, and thus is heavily subsided. Restoration of Bel Marin Keys would develop habitat for federal endangered species, including the Ridgway's Rail and the salt marsh harvest mouse. Recently snowy plovers and least terns have made limited use of Hamilton, an added benefit that may also be realized at Bel Marin Keys.

   The site is subsided, with an insufficient, rip-rapped shoreline berm requiring constant maintenance to prevent flooding of the adjacent properties and community. As part of the restoration project, a flood risk management levee will be constructed between the tidal area and a residential community, increasing flood and storm protection. It would also provide additional flood water absorption capacity, as storm waters are currently pumped off the site during winter storms. Restoring this site would improve and stabilize the shoreline, reducing the need to maintain its current hardened edge, and increasing this region's ability to manage risk through adaptation and tidal sediment trapping as the site develops.

   In addition, Bel Marin Keys design improves infrastructure by realigning a treated wastewater pipeline, reducing costly maintenance for the local sanitary district. The recreational opportunities on this site include a portion of the Bay Trail, making a connection between two existing trails and overlooks.

   Under the current design, this site would accept 9.5 mcy of dredged sediment to construct tidal wetlands. This site is currently in the permitting phase. Construction of the levee is planned for 2019 and 2020, and the site would be ready to start receiving dredged sediment in 2020.

d. **Eden Landing Ecological Reserve Wetland Restoration Project (Eden Landing)**. Phase II of the Eden Landing project would restore and enhance approximately 2,300-acres of former salt ponds to a mix of wetland habitats while simultaneously providing coastal flood risk management and wildlife oriented public access and recreation in the southern portion of San Francisco Bay. Located adjacent to Hayward and Union City, the site is owned and operated by the California Department of Fish and Wildlife (CDFW). This project is a significant portion of the multi-agency South Bay Salt Pond Restoration Project, a Federal, State, and local effort to restore 15,000 acres of former industrial salt production ponds to a mix of wetland habitat.

   This project is currently under environmental review (under the California Environmental Quality Act and National Environmental Protection Act), with the Draft EIR/EIS to be released to the public within the next month. The proposed project would raise and improve existing levees

or berms and make other improvements to improve coastal flood risk management for the neighboring Union City and Hayward Community, including residential and commercial properties, as well as the Union Sanitary District's wastewater facility. The use of dredged sediment in this site would reduce wave fetch in storms, providing additional protection to development landward of the site, as well as provide early development of tidal vegetation on the site. This project will provide recreational trails for wildlife and cultural artifact viewing and interpretation related to the historic salt works, as well as educational volunteer opportunities to assist with plantings and site management. Eden Landing also provides hunting and fishing opportunities, and a new boat launch and parking lot built as part of Phase 1.

This site has the capacity for 7.2 mcy of dredged sediment and is most closely associated with the Redwood City Harbor, directly across the Bay. A recent study by the Conservancy has established a potential model contracting opportunity for offloading sediment at the site, providing some efficiencies for equipment use. This site is estimated to be permitted and operational in 2022.

Navigation Dredging. The USACE maintains seven deep draft channels within San Francisco Bay to provide navigation safety, readiness, and economic benefits to the nation, four of which are included in this proposal. As part of this activity, 1.5-2.5 mcy annually of dredged sediment is produced that can be used to restore appropriate elevations for wetland development at critical restoration sites. Placement of the sediment will also provide flood risk management and storm damage protection to vulnerable communities and public infrastructure. The Bay Area dredging and restoration community have considerable experience and expertise in reusing this valuable resource, which we believe provides a great return on investment to the region and the nation. Through this proposal we have identified the following navigation projects that would provide a significant contribution to adaptively managing risk in the region from multiple drivers.

It is worth noting that each of these channels undergo regular sediment quality analysis to ensure that the sediment is physically and chemically suitable for the proposed placement site. With the exception of limited portions of Richmond Inner Harbor and the Redwood City Harbor Turning Basin, these channels have routinely shown that the quality of the sediment is appropriate for wetland restoration. Sediment that is not appropriate for contact with aquatic species in most cases can be used as foundation material at Montezuma. In addition, these projects regularly receive water quality certification and waste discharge requirements from the San Francisco Bay Regional Water Quality Control Board (Water Board) and federal consistency determinations concurrence from the San Francisco Bay Conservation and Development Commission (BCDC). By maximizing the reuse of dredged sediment from these channels, the proposed projects would meet the goals of Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS), the program that guides navigation dredging and sediment placement in the region, to which the USACE is a signature partner. The LTMS Program has been noted nationally as a hallmark of Federal, State and local cooperation. We believe the recognition of the range of benefits provided through the recovery and reuse of the commodity will prove very productive to USACE.

a. **Oakland Harbor.** Oakland Harbor is located in the City of Oakland, Alameda County, on the eastern shore of central San Francisco Bay, immediately south of the San Francisco-Oakland Bay Bridge. Oakland Inner and Outer Harbor federal channels provide vital access for commercial vessels to the Port of Oakland, the second largest port on the West Coast and the fifth largest container port in the nation. Deepening of the Entrance Channel, Outer Harbor Channel, and Inner Harbor Channel to -50 feet Mean Lower Low Water (MLLW) was completed early in 2010.

The Entrance Channel, Outer Harbor Channel, and Inner Harbor Channel are typically dredged annually using clamshell-bucket equipment. Dredged sediment from Oakland Harbor has been less than 80 percent sand on average. Prior to 1999, all dredged sediment from Oakland Harbor was placed in-Bay at the Alcatraz Island disposal site (SF-11); since 1999, it has been placed at the SF-DODS deep ocean disposal site, Montezuma Wetlands Restoration Project, Hamilton Wetlands Restoration Project, and to a limited extent at Alcatraz Island disposal site. The Port of Oakland is the non-federal project sponsor.

Dredged sediment from this project would be suitable for Cullinan, Montezuma, Bel Marin Keys, and Eden Landing. This navigation channel is in closer proximity to all of the restoration sites than the SFDODS.

b. **Richmond Harbor.** Richmond Harbor consists of an inner and outer Harbor, both dredged on an annual basis. The Port of Richmond is the non-federal project sponsor.

- **Richmond Inner Harbor** (Inner Harbor) is located on the east side of central San Francisco Bay within the boundaries of Contra Costa County and provides commercial navigation access to privately-owned and the Port of Richmond-owned marine terminals. Although authorized to -41 feet MLLW, the channel was most recently deepened to -38 feet MLLW in 1998. The Inner Harbor is typically dredged annually using clamshell-bucket equipment, with the exception of the Santa Fe Channel portion, which has not been dredged since 1999 due to contaminant issues. Dredged sediment from the Inner Harbor has typically been less than 80 percent sand. Prior to 1997, all dredged material from the Inner Harbor was placed at SF-11; since 1997 it has been placed at SF-DODS, Alcatraz, the Hamilton, Cullinan Ranch, and the Montezuma.

- **Richmond Outer Harbor** (Outer Harbor) is located on the east side of central San Francisco Bay within the boundaries of Contra Costa County, with the exception of the Southampton Shoal Channel, which is predominately in San Francisco County. The Outer Harbor provides deep-draft navigation access to the Port of Richmond marine terminals. Deep-draft tankers also use the harbor channel for loading and off-loading petroleum products at the Chevron Richmond Long Wharf facility. The Outer Harbor was last deepened in 1965 to -45 feet MLLW. The Outer Harbor is typically dredged annually using a hopper dredge, although clamshell bucket equipment has been used on occasion. Dredged sediment from the Outer Harbor has typically been less than 80 percent sand and has been typically placed in-Bay at the Alcatraz disposal site.

Dredged sediment from this project would be suitable for Cullinan, Montezuma, Bel Marin Keys, and Eden Landing. This navigation channel is in closer proximity to all of the restoration sites than the SFDODS.

c. **Redwood City Harbor**. Redwood City Harbor is approximately 18 nautical miles south of San Francisco on the western side of South San Francisco Bay. It provides deep-draft access to the Port of Redwood City within the confines of Redwood Creek. Redwood City Harbor was last deepened in 1962 to -30 feet MLLW. The Entrance Channel, Outer Turning Basin, Connecting Channel, and Inner Turning Basin are typically dredged every 1 to 2 years using clamshell-bucket equipment. Dredged sediment from Redwood City Harbor has typically been less than 80 percent sand and has predominantly been placed at Alcatraz disposal site (SF-11), though beneficial use at wetland restoration sites has taken place three times since 2008 (adjacent Inner Bair Island in 2008/9, Hamilton in 2009, and Montezuma in 2015). The Port of Redwood City is the nonfederal project sponsor.

Dredged sediment from this project would likely be suitable for Cullinan, Montezuma, Bel Marin Keys, and Eden Landing. This navigation channel is in closer proximity to Cullinan, Bel Marin Keys and Eden Landing than the SFDODS, and is most proximal to Eden Landing.

d. **Pinole Shoal Channel**. Pinole Shoal Channel is located in the San Pablo embayment of San Francisco Bay and connects to the Suisun Channel through Carquinez Strait. It provides deep-draft access to the Ports of Stockton and Sacramento, as well as a number of oil terminals along the Strait. Pinole Shoal is regularly maintained at -35 feet MLLW and has occasional advanced maintenance dredging to -37 feet in portions of the channel. It is typically dredged annually using the hydraulic dredge the *Essayons*, though may in future years use clamshell-bucket equipment. Dredged sediment from Pinole Shoal has typically been greater than 80 percent sand, and has predominantly been placed at San Pablo Bay disposal site (SF-10), and at times at the Carquinez Strait disposal site (SF-9) or the Alcatraz disposal site. The local project sponsor for this channel is the Contra Costa County Board of Supervisors and the Port of Stockton.

   Dredged sediment from this project would be suitable for Cullinan, Montezuma, Bel Marin Keys, and Eden Landing if they required fine sands. This navigation channel is in closer proximity to Cullinan, Montezuma, Bel Marin Keys, and Eden Landing than the SFDODS, and is most proximal to Cullinan Ranch.

Table 1. Federal Channel Project Detail Summary

	Authorized or Regulatory Depth (feet below MLLW)[1]	Length (feet)	Width (feet)	Area (acres)	Historic Dredge Type	Typical Dredging Cycle (years)	Planning Volume per Episode (cy)	Federal Standard Site[2]
Oakland Inner and Outer Harbor	50	40,100	800-900	863	Clamshell Bucket	Annual	350,000 – 700,000	Ocean
Richmond Inner Harbor	41 authorized 38 maintained	20,000	500 - 600	459	Clamshell Bucket	Annual	350,000 – 400,000	Ocean
Outer Harbor	45	6,000 + maneu-vering area at Long Wharf	600	550	Hydraulic Hopper/ Clamshell Bucket	Annual	150,000 – 250,000	In-Bay Alcatraz
Redwood City Harbor	30	19,100	300 – 900[3]	181	Clamshell Bucket (Harbor Channels)	1-2	300,000 – 600,000	In-Bay Alcatraz
Pinole Shoal	35				Hydraulic Hopper/ Clamshell Bucket	Annual	200,000 – 350,000	In-Bay San Pablo

Notes: 1. Two-foot overdredge allowance not shown.

2. The federal standard is defined as the least-costly dredged material disposal or placement alternative consistent with sound engineering practices, and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria (33 C.F.R. § 335.7).

3. Varies from 300 feet in Entrance Channel to 900 feet in Inner & Outer Turning Basins

The Resilient San Francisco Bay Proposal provides opportunities for several efficiencies within the USACE navigation program, including phased site use, regulatory compliance, advantageous use of existing equipment, reduced fuel use, cost efficiencies, and potential contracting improvements. Because the proposal includes four beneficial use sites, with immediate use available at two which have sufficient capacity for targeted channels for over 5 years, the two sites in permitting and review have sufficient time to obtain regulatory and environmental clearance and be ready to accept material as the first two are completed. In this way the dredging contracts can be optimized to take sediment to these sites, travel shorter distances and use available equipment, reduce fuel use. Because the offloading equipment is mobile and can be used with existing, standard sized scows, it can be relocated to another site as needed. For example, when Hamilton was operational, the Liberty (Montezuma's offloader) was relocated and then returned to Montezuma once Hamilton was complete. Having four federal channels providing sediment to one or two sites simultaneously

would maximize the use of the offloading equipment and thereby reduce costs (Appendix B provides details of concept). If Federal contracting rules allow, navigation contracts placing sediment at beneficial use sites could be bundled either by year or location, creating even greater efficiencies in contract delivery. For example, a multi-year contract dredging contract could be developed that designates the four restoration sites, thereby providing larger volumes of sediment to be dredged and certainty for the contract over a period of time, resulting in economies of scale. Lastly, because the NOAA's National Marine Fisheries Service has amended its LTMS Programmatic Biological Opinion, dredging projects that take sediment to restoration sites that would benefit fish habitat (all four proposed sites fit this description) could dredge outside of the environmental work windows, adding greater flexibility in the navigation program.

Strategic Aquatic Placement of Dredged Sediment (Strategic Placement). Recent research suggests that the current sediment suspended sediment supply to wetlands will not be sufficient to support their adaptation to rising seas, reducing the region's adaptive capacity overtime. Understanding mechanisms that supply and trap sediment in wetlands is critical to management actions that may counteract this imbalance. The USACE and a team of technical and scientific experts have developed a "strategic placement framework" describing methods that may augment sediment supply to this critical natural infrastructure. The conceptual model includes placing dredged sediment either through bottom dumping of a scow or via pipeline to shallow areas adjacent to a wetland that is in need of sediment. Once the sediment is placed, theoretically the tides and currents would re-suspend the sediment and transport it in suspension over the marsh plain. Once there, the sediment would drop out of suspension and be deposited on the marsh. Recent modeling studies have suggested that this technique may be feasible and effective (Bever et al. 2014). This proposal advances a four-element approach for examining the efficacy of this technique including: a) baseline monitoring; b) a tracer study; c) modeling; and d) a pilot placement event. The baseline monitoring will occur both prior to the tracer study and after the pilot project. It will include monitoring of biologic and physical elements, such as benthic population and natural accretion rates. Modeling will be used to design a small-volume pilot study, and data collected during and after the pilot study will be used to validate the model. The tracer study will monitor sediment movement, concentration, and deposition immediately following placement and determine the ultimate fate of placed sediment. The validated post-tracer study model will then be applied to plan the pilot project and validated using data collected during and after the pilot project. The pilot project will be coupled with repeated multi-beam surveys and extensive monitoring.

4. **Non-federal interest.** The California State Coastal Conservancy will be the non-federal sponsor for this project, providing implementation support for the four restoration projects. The Conservancy would also provide the non-federal cost share of the aquatic placement pilot project and any non-federal cost share allowed under Section 1122.

   The Conservancy is a state agency, established in 1976, to protect and improve natural lands and waterways, to help people get to and enjoy the outdoors, and to sustain local economies along California's coast. The Conservancy is a non-regulatory Coastal Zone Management agency that supports projects to protect coastal resources and increase opportunities for the public to enjoy the coast. The Conservancy works along the entire length of California's coast, the San Francisco Bay, and within the watersheds of rivers and streams that extend inland from the coast. Since its creation, the Conservancy has restored and preserved hundreds of thousands of acres of wildlife habitat, coastal farmland, and scenic open space, and built many miles of public access trails. The Conservancy has an impressive track record of wetland restoration and other projects, and has

significant experience partnering with USACE on projects, including the Hamilton Wetlands Restoration Project, the Napa River Salt Marsh, and the South San Francisco Bay Shoreline Project.

5. **Authorized Water Resource Development Act (WRDA) Projects**. Bel Marin Keys is a WRDA 2007 authorized aquatic ecosystem restoration project. Cullinan Ranch is a USFWS owned and managed project, and WRDA 2014 included language that allows the USACE to contribute to other Federal efforts. Eden Landing is the State-owned portion of the South Bay Salt Pond Restoration Project, a Federal, State, and local partnership to restore former industrial salt ponds to tidal and managed wetlands and improve flood risk management.

6. **Estimate of Total Project Costs** (federal and non-federal costs). For the Resilient San Francisco Bay project, the primary cost is the incremental cost of delivering dredged sediment from the four navigation dredging projects to the four restoration sites over a ten year period. According to the Federal Register (Volume 83, No. 28), "projects under the pilot program that use dredged material from federal navigation projects, Section 1122(e)(2) provides the incremental costs above the federal standard for transportation and depositing such dredged material will be borne entirely by the federal government." Therefore, an additional transportation costs and/or site "tipping fees" would be paid for by the USACE. The Conservancy is open to discussing how non-federal funds could maximize beneficial use of dredged material at the four restoration sites and be brought to bear in this pilot program, under the Section 1122 cost share agreement. The Strategic Placement portion of the project would be cost shared between the federal and non-federal sponsor at a rate of 65% to 35% respectively for construction, while federal funds would be provided for study activities. Because the cost to dredge, transport and place sediment varies from year to year depending on contractor bids, cost information is provided in ranges and is estimated. Further, because there is experience placing dredged sediment at Cullinan Ranch and Montezuma, these costs are average actual costs, whereas the Bel Marin Keys and Eden Landing Projects cost analysis is more theoretical. All estimates are provided in comparisons to ocean disposal. The basis for the cost estimates are provided in Appendices B and D.

   Assuming Oakland, Richmond Inner Harbor, and Redwood City were included, the incremental costs were analyzed (see Appendix B) based on total dredge volume needed and a potential likely mix of navigation channel dredge projects. The numbers were developed on an optimized schedule where dredging and placement were occurring within the work windows and in three to four-month periods, maximizing the use of offloading equipment to reduce "standby" costs. Including Richmond Outer Harbor and/or Pinole Shoal in any project would further optimize the schedule and reduce cost by shortening the period that sediment was being placed further.

   Estimates of Bel Marin Keys and Eden Landing are based on the analysis completed in the "South Bay Salt Pond Restoration Project Beneficial Reuse Feasibility Study Conceptual Cost Estimate" and similar study for Bel Marin Keys by Moffatt & Nichol for the Conservancy and the USACE, respectively (Appendix D). The information was further refined for this proposal and in 2018 dollars. It should be noted that for both projects, a 34% was added for soft costs (design, construction management, and contingency). Dredging and transport are not included, however, for both projects the distance to the restoration site is significantly closer than the deep ocean disposal site, especially in the case of Redwood City and Eden Landing, so some cost savings in transportation can be expected though not calculated here.

Table 2. Bel Marin Keys estimates, assuming 9.1 mcy of dredged sediment.

Scenario	Beneficial Use	Ocean Disposal Costs
Optimized	$28.67	$25 (Oakland); $26 (Richmond); $33 (Redwood City)
Non-Optimized	$37.46	$25 (Oakland); $26 (Richmond); $33 (Redwood City)

Table 3. Eden Landing estimates, assuming 7.2 mcy of dredged sediment.

Scenario	Beneficial Use	Ocean Disposal Costs
Optimized	$23.82	$25 (Oakland); $26 (Richmond); $33 (Redwood City)
Non-Optimized	$41.18	$25 (Oakland); $26 (Richmond); $33 (Redwood City)

The incremental cost above ocean disposal estimates for Cullinan ($3.50/cy) and Montezuma ($6.00/cy) were provided by the site managers/owners. These numbers did not vary by distance from the dredging channel to the placement site, so some incremental cost may need to be considered.

Table 4. Total incremental cost by site and volume. Details can be found in Appendices B and D.

Project	Volume Needed	Total Incremental Cost
Cullinan Ranch	2.0 mcy	$6.5 million
Montezuma (Phase 2)	4.5 mcy	$24.9 million
Bel Marin Keys	9.1 mcy	$29.4 million
Eden Landing	7.2 mcy	- $13 million (savings)
Total	**22.8 mcy**	**$47.8 million**

Strategic Placement. The total cost of the Strategic Placement study would be approximately $3.6 million for design, modeling, monitoring, a tracer study and a small, proof of concept pilot project. Using the Section 204 cost share criteria, the total cost of the study aspects is $2.6 million, and construction costs are $1 million, ($650,000 federal, $350,000 Conservancy), for a total $3.25 million federal and $350,000 local project sponsor (Conservancy).

Table 5. Estimated Order-of-Magnitude Costs of Strategic Placement Study.

Project Elements	**Estimated Cost**	**Notes**
Pilot Design	$500,000	Identify site, design proposed pilot
Baseline Monitoring	$500,000	Pre-tracer study; Post-pilot
Tracer Study	$1,200,000	Independent mobilization of small scow
Modeling	$400,000	Pre-tracer and Post-tracer study; Post-pilot
Small Pilot Project	$1,000,000	Scows from routine maintenance project
Total	**$3,600,000**	$3.25 million federal

The total proposed project cost, including the strategic placement study is $51.05 million over ten years.

As noted in other sections of this document the restoration projects identified in this proposal are contributing significant funds ($153.8 million) and efforts in preparing the sites to receive dredged sediment. Table 6 below highlights the activities that the restoration project sponsors have paid for in developing these sites, and thus activities that the USACE will not have to undertake to implement this proposal. The Conservancy is also open to discussions with USACE about bringing non-federal funds to bear towards the incremental cost of transportation and placement at the four restoration sites, and how this might be cost-shared under a Section 1122 cost share agreement.

Table 6. Activities and Responsible Parties.

Activity	USACE	Local Sponsor
Site Preparation		X
Lands, Easements and Right-Aways		X
Environmental Documentation and Permitting		X
Feasibility and Design		X
Monitoring		X
Mitigation		X
Dredging and Transportation	X	
Dredged Sediment Placement	X	

7. **Estimate of Monetary and Non–Monetary Benefits**. The proposed beneficial reuse projects have numerous environmental, economic, and social benefits detailed here.

   a. **Environmental Benefits.** San Francisco Bay has lost 85 percent of its historical wetlands due to diking, filling and dredging during the mid-1800s to mid-1900s and therefore tidal marsh habitat is scarce in the region. The Resilient San Francisco Bay Project would use 29.2 mcy of dredged sediment that would otherwise be wasted to restore four subsided baylands providing significant ecological benefits, including restoration of 7,331 acres of tidal wetlands and endangered species habitat, improved water quality through nutrient processing, and additional feeding and spawning grounds for native fish and wildlife. Threatened, endangered, and species of special concern that will benefit from these projects include Ridgway's Rail, salt marsh harvest mouse, Black Rail, Savannah song sparrow, common yellow throat, least tern, snowy plover, Delta smelt, longfin smelt, and salmons. The restoration projects also provide nurseries for commercial and recreational fisheries, including Pacific herring, Dungeness crabs, salmon, and striped bass. Further, because these sites are disturbed subsided sites, they currently do not support federally listed species, so threatened and endangered species and their critical habitat, is not anticipated to be impacted by these projects. This is reflected in the project's biological opinions (Eden Landing has not yet obtained its biological opinion, but proposed site design avoids impacting listed species).

      Together these sites total **7,331** acres of restored wetlands:

      - **Cullinan Ranch**: 1,575-acre tidal wetlands, 300 acres of which is specifically targeted for salt marsh harvest mouse habitat
      - **Montezuma**: 1,880 acres of tidal and seasonal wetland habitats, with 502 acres to be restored in Phase 2
      - **Bel Marin Keys**: 1,576 acres of tidal and seasonal wetlands

- **Eden Landing**: 2,300 acres of tidal and seasonal wetlands

All four of these restoration sites are designed to create habitat that restores the hydrologic character and geomorphic processes of tidal marshes and seasonal wetlands, including the development of dendritic channels throughout the sites. The placement of dredged sediment raises the elevation of the sites so that at the time of breach, geomorphic processes such as tidal inundation, sediment accretion and channel formation will be restored and create a self-sustaining system. Without the addition of dredged sediment the sites would take many decades to develop tidal vegetation (if tidal vegetation can be achieved at all given rising water levels and reduced suspended sediment concentrations in the Bay) and the restoration sites are unlikely to become self-sustaining.

The development of the Strategic Placement methodology would further the understanding of whether placing sediment in the nearshore environment would be effective in increasing sediment deposition in existing marshes and mature restoration sites, thereby increasing their adaptive capacity. It is our understanding that this specific proposal has not been tested, and if successful would add an additional tool to maintain shorelines and reduce risk of habitat loss and other ecosystem services, and improve flood risk management.

Federal and Regional Plans. In the Bay Area, several evaluations have been completed, analyzing and documenting the need for tidal and seasonal wetland restoration in San Francisco Bay embayments. The Resilient San Francisco Bay proposal supports at least five of these regional plans to restore habitat and species in this nationally important estuary. In the 1980s San Francisco Bay was recognized in the National Estuary Program by the US Environmental Protection Agency, resulting in the development of the Comprehensive Conservation Management Plan (CCMP), which is now administered by the San Francisco Estuary Partnership. The CCMP was updated in 2016 and includes several implementation objectives for the restoration of the estuary. This project contributes to multiple goals outlined in the CCMP, including sustaining and improving the Estuary's habitats and living resources, bolstering shoreline resilience, and improving water quality.

Similarly, the US Fish and Wildlife Service and NOAA's National Marine Fisheries Service have respectively undertaken Recovery Plans for the "Tidal Marsh Ecosystems of Northern and Central California" and the "North Central California Coast Salmon & Steelhead". This project contributes to the recovery of both habitat and species population for these federal plans.

In 2015, the Conservancy, working with over 200 scientists and managers with expertise in San Francisco Bay, updated the "Baylands Ecosystem Habitat Goals Report (U.S. EPA, San Francisco Bay Regional Water Quality Control Board, and State Coastal Conservancy, original document 1999, updated 2015)". The Baylands Ecosystems Goals Report update reiterated the goal and the need to restore tidal marshes to achieve a total of 100,000 acres, but added the urgency to complete this work by 2030 to reduce tidal flooding risk and to build adaptive risk management capacity for the region. This plan documents the multi-benefits of engineering with nature to create abundant wildlife habitat, increase coastal flood risk management for communities, and provide public recreation areas. The proposed project is designed to implement the recommendations of the Baylands Ecosystem Goals Report. Similarly, the San Francisco Bay Joint Venture, a partnership working to protect wetlands for the benefit of wildlife and people along the Pacific Flyway, completed its Implementation Strategy in 2001. This strategy includes goals for several different types of wetland habitat, specifically 12,000 acres of seasonal wetlands and 100,000 acres of tidal marshes, which this proposed project advances.

Potential Contaminant Issues. All of the proposed restoration sites are appropriate for tidal and seasonal habitat development. Bel Marin Keys V includes a 240-acre parcel of land known as the North Antenna Field (NAF), a formerly used defense site. The North Antenna Field was used by the Army for incineration of unexpended small arms, fire suppression practice, shooting practice, and waste disposal. The property has been the subject of extensive investigation and cleanup activities over the past 15 years and is close to completion. It is anticipated that a no further action, Record of Decision will be completed soon. There are no other contaminant issues at the four sites.

In addition to the placement sites, the dredged sediment proposed for beneficial use is tested in accordance with the Inland Testing Manual and is regularly determined to be appropriate for beneficial use by the four regulatory agencies managing this activity. The sediment has been shown to meet the San Francisco Bay Regional Water Quality Control Board's Beneficial Reuse Guidance (2000), as well as the site specific dredged sediment acceptability criteria provided in the federal biological opinions. Sediment dredged from federal navigation channels is generally deemed suitable for placement at wetlands. It is the rare case that the federal navigation channels proposed for this project have contaminated sediments that are not suitable and that sediment would not be beneficially reused but placed at the Deep Ocean Disposal Site.

Economic Benefits. The economic benefits of these projects are multi-faceted, including coastal flood risk management for communities, stabilization of shorelines, ecosystem services, carbon sequestration, and job creation. Because these projects will produce large tracts of vegetated marshes, they will provide coastal flood risk management to communities located landward of the site by reducing wave run-up across the sites, calming tidal waters. At Bel Marin Keys, Eden Landing and Cullinan, fluvial flooding from the local creeks and rivers would be reduced during high tide and storm events when fluvial flows are block by incoming tides because the wetlands will provide alternate space for flood waters. Each project would stabilize varying lengths of shoreline where either erosion is currently occurring or un-engineered "levees" are the first line of defense. Cullinan will stabilize 1.2 miles of shoreline along Dutchman Slough; Montezuma will stabilize 5.4 miles along Montezuma Slough; Bel Marin Keys will stabilize 2.5 miles along San Pablo Bay; and Eden Landing will stabilize 2.0 miles long the South Bay shoreline. In addition, Cullinan Ranch's southern property boundary is State Highway 37, a major thoroughfare connecting North and East San Francisco Bay cities, industry and communities. As part of its risk reduction plan, Cullinan Ranch constructed a significant levee to protect Highway 37 from tidal flooding and storm surge, making it more resilient and increasing public safety.

The Eden Landing site includes raising and improving existing levees or berms and making other improvements to improve coastal flood risk management for residential and commercial properties, as well as infrastructure. The proposed shoreline restoration project at Eden Landing would improve coastal flood risk management for 593 acres of developed lands in the Cities of Hayward and Union City. These lands are primarily residential and commercial and include the Union Sanitary District, a 33 million gallon per day wastewater treatment plant that serves 347,000 people in the Cities of Fremont, Newark, and Union City. The vulnerable population is minimally about 9,177 people, in 2,533 housing units, and 36 miles of roads. Using a three-foot high tidal flooding scenario, with levee failure, it is estimated that $1.1 billion worth of property and infrastructure would be damaged.

The Bel Marin Keys Restoration Project is immediately adjacent to the Bel Marin Keys Community, a residential community of approximately 2,200 people on the northwest boundary of the property. The shoreline restoration project will also improve coastal flood risk

management from San Pablo Bay, though the community is also susceptible to tidal flooding via Novato Creek. To the west of the restoration is the Ignacio Business Park and the intersection of Highway 101 and Highway 37. The Novato Sanitary District's sewer outfall runs in the levee between Hamilton and Bel Marin Keys and the project offers opportunities to integrate restoration and discharge of treated wastewater. Five Pacific Gas and Electric high-power lines are located on the Bel Marin Keys property and the levee and tidal wetlands restoration have been configured to ensure these lines are on the upland side of the restoration area.

If the Bel Marin Keys site was not restored and the outer levees failed due to tidal flooding, the for Bel Marin Keys community and the City of Novato - 2,395 people would be impacted, with 331 residences valued at $673 million, in addition to the infrastructure listed above.

With the Resilient San Francisco Bay Project, the region is leveraging $153.8 million of local, regional, state, and non-USACE federal funding as evidence of the critical need, and partnership between organizations and agencies at all levels. This activity along with the dredging of the navigation channels support two distinct economies and indirectly supports the communities in which they occur. The restoration projects support jobs in the biological, engineering, modeling, non-profit, consulting, construction and resource and regulatory agencies. The navigation dredging supports jobs in the construction and maritime industry, particularly marine construction.

b. **Social Benefits.** These for projects provide recreational opportunities and open space in the highly urbanized Bay Area, home to over 7 million people. The Bay trail, a 400-mile bayshore loop trail that provides hiking and biking access to the Bay is three-quarters complete, with connecting segments targeted throughout the region. Each one of the restoration projects contains one of these key segments that will help complete the Bay Trail system. Because Bel Marin Keys and Eden Landing are adjacent to urban centers, the opportunity to use the open space during breaks and in the even provides stress reduction and health benefits to local workers.

   In addition, each site has additional features, such as Bay side seating, picnicking, and viewing areas. Cullinan and Montezuma have kayak launch ramps, and Montezuma hosts a fishing pier – a highly prized commodity in Suisun Marsh. These restoration projects also provide opportunities for volunteers to contribute to the restoration process through vegetation management, plantings, and docent-led walks. School children from local communities have participated in science programs and volunteering through Point Blue Students and Teachers Restoring Wetlands Program, instilling the life-long nature appreciate, learning and volunteering. Local Boy and Girls Scouts, Americorps members, and North Bay Conservation Corps teams have similarly contributed to these projects, including through Eagle Scout Projects.

   These sites also include interpretative facilities providing educational signage that describes the restoration process, local geology, and species and habitat information, helping the public gain a greater understanding of this resource. Eden Landing is unique in that it provides opportunities to view historic salt making works – a culturally significant activity in the region. As each site is reviewed for compliance with federal regulations, cultural resources are evaluated and protected, therefore there are no anticipated negative impacts to culturally significant resources.

c. **Other Benefits**. Additional benefits of this proposal are that project beneficial use sites are being prepared and permitted by other entities, providing efficiencies that would show early success for the WIIN Section 1122 program. The Conservancy is a proven partner of the USACE

and has experience in managing wetland restoration projects with beneficial use of dredged sediment, as does Montezuma LLC, and the USFWS. Further, because two of the projects are currently permitted and operational, and a third will be permitted in 2018, the USACE would not incur costs associated with obtaining permits and is assured that all state and federal regulatory requirements are met. Based on successful permitting of Phase I of Eden Landing restoration, it is anticipated that CDFW would also receive full regulatory authorization in time for implementation of this program. By having the multiple channel, multiple beneficial use site approach, the Federal government would reduce downtimes and increase efficiencies of the operation and provide the most cost-effective approach to reusing the needed sediment.

8. **Local Support of the Project**. The Resilient San Francisco Bay project has significant local support as demonstrated both by funding and letters of support contained in Appendix C. Letters of support are being provided by the following entities: The Bay Planning Coalition, California Department of Fish and Wildlife, Citizens Committee to Complete the Refuge, Ducks Unlimited, Montezuma Wetlands, L.L.C., Port of Oakland, Port of Redwood City, San Francisco Bay Regional Water Quality Control Board, Save The Bay, Dredge Research Collaborative, Scape landscape Architecture, NOAA's National Marine Fisheries Service, and the US Fish and Wildlife Service.

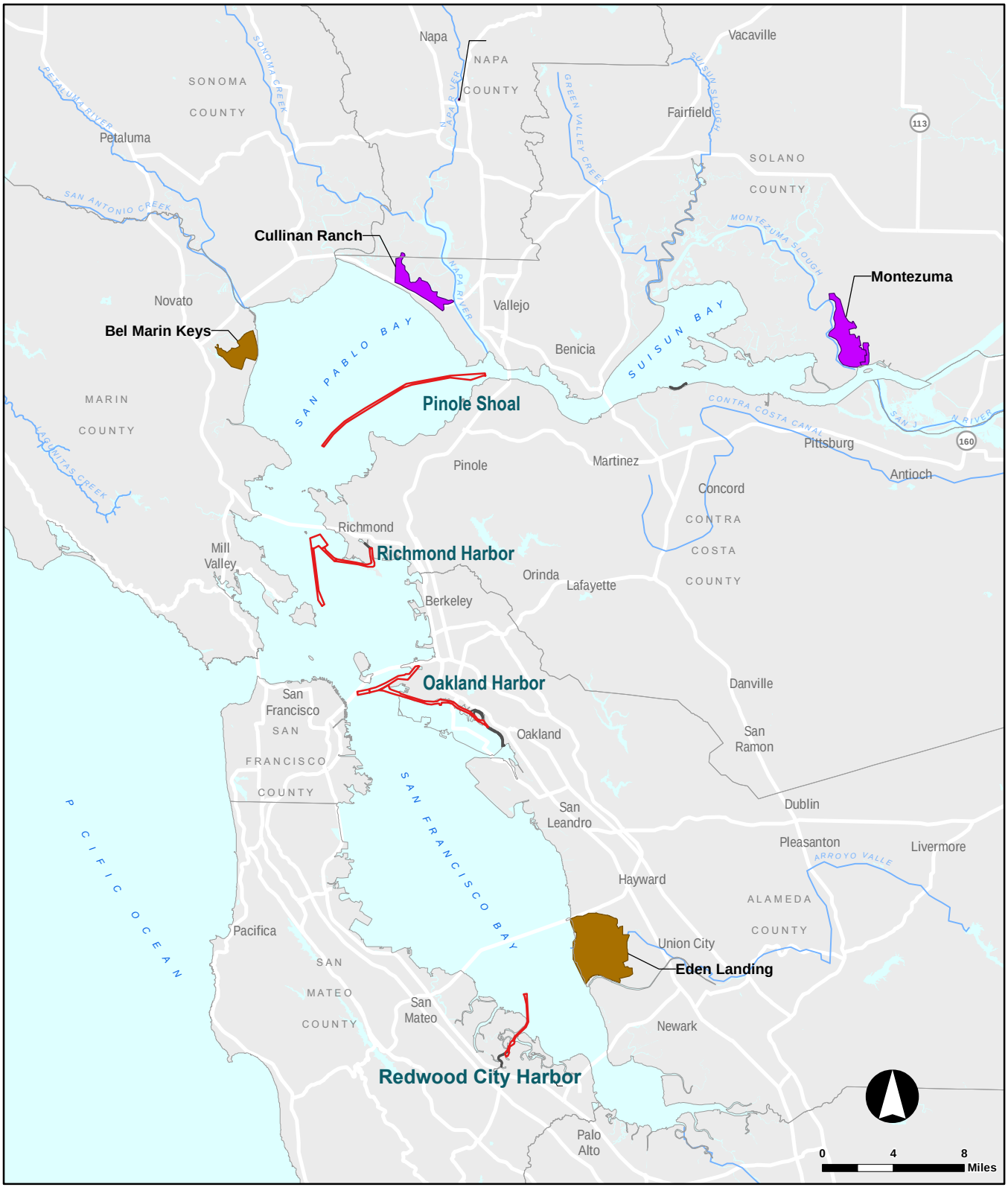
9. **Non-federal Interest's Statement of Financial Ability to Cost Share**. The Conservancy has cost-shared projects with USACE in the past and has executed several feasibility cost share agreements and project partnership agreements with USACE, for projects such as Hamilton Wetlands Restoration, Napa River Salt Marsh, and South San Francisco Bay Shoreline. The Conservancy would be able to tap into two primary funding sources for cost sharing this program: Measure AA funds and State Resource Bond funds.

   In June of 2016, voters in the nine-county San Francisco Bay Area approved Measure AA, a $12 per parcel tax for wetlands habitat restoration in San Francisco Bay, and associated coastal flood risk management and public access elements of restoration projects. Measure AA will generate $25 million per year for the next twenty years, for a total of approximately $500 million. The San Francisco Bay Restoration Authority, a 7-member board of local elected officials, oversees the funding and will be providing grants to restoration projects starting in April of 2018. If San Francisco Bay is selected as one of USACE's ten beneficial use pilot programs, the Conservancy would seek the authorization of the San Francisco Bay Restoration Authority board to apply Measure AA funds towards the non-federal cost share.

   The Conservancy currently has approximately $200 million of funding for project support along the coast of California and in the San Francisco Bay Area. The majority of this funding is state resource bond funds approved by California voters, primarily from Proposition 84 in 2006 and Proposition 1 in 2014. In June of 2016, Proposition 68 will be on the statewide ballot. Proposition 68 is a $4 billion resource bond that includes over $200 million for the Conservancy, including $25 million specifically for San Francisco Bay restoration projects. In November of 2016, an $8.8 billion water bond will likely be on the statewide ballot. This water bond includes $200 million for the San Francisco Bay Restoration Authority to match Measure AA funds.

   The Conservancy is open to discussions of how to bring these non-federal funds to bear towards the incremental cost of transportation and placement of dredged material. The Conservancy's goal is to accelerate the pace and scale of restoration at the four proposed sites and beneficially use a greater percentage of USACE's annual O&M dredged material.

Figure 1. Map of Resilient San Francisco Bay Project proposed federal navigation channels and beneficial reuse sites locations.



SAN FRANCISCO BAY WIIN PILOT PROJECT

- Existing Placement Sites
- Future Placement Sites
- Dredge Sites

Appendix A
Restoration Site Development
Project Sponsor Contribution (Non-USACE)

1. **Cullinan Ranch Wetlands Restoration Site, East Unit (A 300-acre portion of the overall project)**
   a. Land acquisition: $6.5 million
   b. Feasibility Study: $350,000
   c. Design and Permitting: $200,000
   d. Site Construction: $6.5 million
   Total Contributed Project Costs: $13.5 million

2. **Montezuma Wetlands Restoration Project**
   a. Land acquisition: $3.9 million
   b. Design and Permitting: $6.3 million
   c. Engineering: $1.9 million
   d. Site Construction: $26.9 million
   e. Liberty Offloader and Barges: $2.8 million
   f. Equipment Maintenance and Repairs: $1.9 million
   g. Post Site Closure Fund: $4.4 million
   Total Contributed Project Costs: $48.2 million

3. **Bel Marin Keys Unit V Wetlands Restoration Project (Expansion of Hamilton Wetlands)**
   a. Land acquisition: $16 million
   b. Feasibility Study: $1.8 million
   c. Design and Permitting: $2.3 million
   d. Site Construction: $17 million
   Total Contributed Project Costs: $37.1 Million

4. **Eden Landing Restoration Site**
   a. Acquisition: $13.8 million
   b. Planning, Design, and Environmental Documentation: $5 million
   c. Construction Design and Permitting: $1.2 million
   d. Construction: $35 million
   Total Contributed Project Costs: $55 Million

Total Estimated non-USACE Contributed Project Cost of All Four Sites: $153.8 million

Appendix B
Dredged Sediment Placement Cost Information
Incremental Cost Assessment

Assumptions.

1. Volume of sediment produced by each of four dredging projects are averaged, recognizing variability in shoaling and funding, and as follows:
    a. Oakland Harbor – 600,000 cy annually
    b. Richmond Inner Harbor – 350,000 cy annually
    c. Redwood City Harbor – 350,000 cy annually
    d. Pinole Shoal – 350,000 cy annually
    e. Richmond Outer Harbor – 200,000 cy annually
2. There are multiple potential combinations of projects that can be distributed to restoration sites. This analysis using an optimal mixture for maximizing beneficial reuse.
3. All sites will not receive equal volumes of sediment.
4. Bel Marin Keys will likely not accept sediment until 2020 and Eden Landing until 2021/2, therefore these two projects would likely receive less sediment during this pilot project.
5. Comparisons made against ocean disposal costs for each channel.
6. Pinole Shoal and Richmond Outer Harbor are not included in this cost analysis, however, if they were to place dredged sediment in the placement sites, a greater cost savings may be realized due to optimal use of equipment, close proximity, and reduced time that would elapse while sites are under construction.

1. **Cullinan Ranch:**
   Volume of Sediment Needed 2.0 mcy
   Oakland Inner Harbor – 1,200,000 cy (two dredge cycles) @ $3.50/cy = $4.2 million
   Richmond Inner Harbor – 350,000 cy @ $2.50/cy = $875,000
   Redwood City Harbor – 350,000 cy @ $4.50/cy = $1.575 million
   Other non USACE projects – 100,000 cy
   Two years, $6.65 million

2. **Montezuma (Phase 2 only):**
   Volume of Sediment Needed 4.5 mcy
   Incremental cost above ocean disposal $6.00/cy
   Oakland Inner Harbor – 600,000 cy (4 dredge cycles) @ 6.00/cy = $14.4 million
   Richmond Inner Harbor – 350,000 cy (5 dredge cycles) @ 6.00/cy = $10.5 million
   Other non-USACE projects – 350,000 cy
   (no Redwood City due to distance)
   Five years, $24.9 million

3. **Bel Marin Keys V:**
   Volume of Sediment Needed 9.1 mcy
   Oakland Inner Harbor – 600,000 cy (seven dredge cycles) @ $3.50/cy = $14.7 million
   Richmond Inner Harbor – 350,000 cy (six dredge cycles) @ $2.50/cy = $5.25 million
   Redwood City Harbor – 350,000 cy (six dredge cycles) @ $4.50/cy = $9.45 million
   Other non USACE projects – 700,000 cy
   Seven years, $29.4 million

4. **Eden Landing:**
   Volume of Sediment Needed 7.2 mcy
   Oakland Inner Harbor – 1,200,000 cy (five dredge cycles) @ -$1.00/cy = $6 million SAVINGS
   Richmond Inner Harbor – 350,000 cy (five dredge cycles) @ -$2.00/cy = $3.5 million SAVINGS
   Redwood City Harbor – 350,000 cy (five dredge cycles) @ -$9.00/cy = $3.5 million SAVINGS
   Other non USACE projects – 600,000 cy
   Five years, $13 million SAVINGS

COSTS FOR BENEFICIAL REUSE AT THE BEL MARIN KEYS UNIT V RESTORATION SITE

Optimized Scenario

(Dredging and placement completed in 3 months within the allowed windows)

Year	Disposal Volume (CY)	Offloading Cost	Soft Costs	Total Costs for Offloading	Site Prep Costs	Unit Rate
2018	1,140,000	$ 22,173,265	$ 7,538,910	$ 29,712,176	$ 11,400,000	$ 36.06
2019	1,140,000	$ 10,359,427	$ 3,522,205	$ 13,881,632		$ 12.18
2020	1,140,000	$ 10,359,427	$ 3,522,205	$ 13,881,632		$ 12.18
2021	1,140,000	$ 10,359,427	$ 3,522,205	$ 13,881,632		$ 12.18
2022	1,140,000	$ 18,918,408	$ 6,432,259	$ 25,350,667	$ 11,400,000	$ 32.24
2023	1,140,000	$ 10,359,427	$ 3,522,205	$ 13,881,632		$ 12.18
2024	1,140,000	$ 10,359,427	$ 3,522,205	$ 13,881,632		$ 12.18
2025	1,140,000	$ 10,359,427	$ 3,522,205	$ 13,881,632		$ 12.18
Total	9,120,000	$ 103,248,236	$ 35,104,400	$ 138,352,637	$ 22,800,000	$ 17.67

Costs for Non-Optimized Scenario

(Dredging and placement goes through entire 6-month allowed window)

Year	Disposal Volume (CY)	Offloading Cost	Soft Costs	Total Costs for Offloading	Site Prep Costs	Unit Rate
2018	1,140,000	$ 30,622,466	$ 10,411,638	$ 41,034,104	$ 11,400,000	$ 45.99
2019	1,140,000	$ 18,804,627	$ 6,393,573	$ 25,198,200		$ 22.10
2020	1,140,000	$ 18,804,627	$ 6,393,573	$ 25,198,200		$ 22.10
2021	1,140,000	$ 18,804,627	$ 6,393,573	$ 25,198,200		$ 22.10
2022	1,140,000	$ 18,922,201	$ 6,433,548	$ 25,355,749	$ 12,312,000	$ 33.04
2023	1,140,000	$ 18,804,627	$ 6,393,573	$ 25,198,200		$ 22.10
2024	1,140,000	$ 18,804,627	$ 6,393,573	$ 25,198,200		$ 22.10
2025	1,140,000	$ 18,804,627	$ 6,393,573	$ 25,198,200		$ 22.10
Total	9,120,000	$ 162,372,426	$ 55,206,625	$ 217,579,050	$ 23,712,000	$ 26.46

Assumptions:

1. About 9.1 MCY is placed at BMK Unit V via electric offloader (not full 16.1 MCY capacity)
2. Contract is awarded based on Base + 3 Option years (i.e. same contractor for 4 years)
3. Dredging and transport costs are not included (use $11/CY additional for that)
4. Land acquisition and Restoration related grading and breaching is not included in above costs
5. Soft costs include design, construction mgmt, and contingency (34%)
6. Costs are in 2018 $$

To compute incremental unit cost for placement at BMK (vs. DODS), add $11/CY to above to determine Ben Reuse Costs (see below) and subtract current SF-DODS disposal cost

Scenario	Ben Reuse	SF-DODS Costs
Optimized	$ 28.67	$25 (Oakland); $26 (Richmond) ; $33 (Redwood City)
Non-Optimized	$ 37.46	$25 (Oakland); $26 (Richmond) ; $33 (Redwood City)

Based on cost estimates prepared for State Coastal Conservancy (Eden Landing) and Army Corps of Engineers (BMK) by MN

COSTS FOR BENEFICIAL REUSE AT THE EDEN LANDING PONDS RESTORATION SITE

Optimized Scenario

(Dredging and placement completed in 3 months within the allowed windows)

Year	Disposal Volume (CY)	Offloading Cost	Soft Costs	Total Costs for Offloading	Site Prep Costs	Unit Rate
2018	1,440,000	$ 14,668,874	$ 4,987,417	$ 19,656,291	$ 6,000,000	$ 17.82
2019	1,440,000	$ 10,194,614	$ 3,466,169	$ 13,660,782		$ 9.49
2020	1,440,000	$ 10,194,614	$ 3,466,169	$ 13,660,782	$ 6,000,000	$ 13.65
2021	1,440,000	$ 10,194,614	$ 3,466,169	$ 13,660,782		$ 9.49
2022	1,440,000	$ 10,194,614	$ 3,466,169	$ 13,660,782	$ 6,000,000	$ 13.65
Total	7,200,000	$ 55,447,328	$ 18,852,092	$ 74,299,420	$ 18,000,000	$ 12.82

Costs for Non-Optimized Scenario

(Dredging and placement goes through entire 6-month allowed window)

Year	Disposal Volume (CY)	Offloading Cost	Soft Costs	Total Costs for Offloading	Site Prep Costs	Unit Rate
2018	1,200,000	$ 22,189,319	$ 7,544,369	$ 29,733,688	$ 6,000,000	$ 29.78
2019	720,000	$ 18,076,519	$ 6,146,017	$ 24,222,536		$ 33.64
2020	720,000	$ 18,076,519	$ 6,146,017	$ 24,222,536		$ 33.64
2021	1,200,000	$ 18,076,519	$ 6,146,017	$ 24,222,536	$ 6,000,000	$ 25.19
2022	720,000	$ 18,076,519	$ 6,146,017	$ 24,222,536		$ 33.64
2023	720,000	$ 18,076,519	$ 6,146,017	$ 24,222,536		$ 33.64
2024	1,200,000	$ 18,076,519	$ 6,146,017	$ 24,222,536	$ 6,000,000	$ 25.19
2025	720,000	$ 18,076,519	$ 6,146,017	$ 24,222,536		$ 33.64
Total	7,200,000	$ 148,724,954	$ 50,566,484	$ 199,291,438	$ 18,000,000	$ 30.18

Assumptions:

1. About 7.2 MCY is placed at the Eden Landing Ponds site via diesel-powered offloader
2. Contract is awarded based on Base + 4 Option years (i.e same contractor for 5 years) for Optimized scenario and Base + 2 Option years for Non-Optimized scenario
3. Dredging anad transport costs are not included (assume $11/CY additional for that)
4. Land acquisition and Restoration related grading and breaching is not included in above costs
5. Soft costs include design, construction mgmt, and contingency (34%)
6. Costs are in 2018 $$

To compute incremental unit costs for placement at Eden Landing (vs. DODS), add $11/CY to above to determine Ben Reuse Costs and subtract current SF-DODS disposal cost

Scenario	Ben Reuse	SF-DODS Costs
Optimized	$ 23.82	$25 (Oakland); $26 (Richmond) ; $33 (Redwood City)
Non-Optimized	$ 41.18	$25 (Oakland); $26 (Richmond) ; $33 (Redwood City)

Based on cost estimates prepared for State Coastal Conservancy (Eden Landing) and Army Corps of Engineers (BMK) by MN

ANCHOR QEA

March 1, 2018

Strategic Placement of Dredged Material Pilot and Demonstration Study

Previous modeling studies have indicated that strategic open water placement of dredged material may be used in a nature-based strategy to augment sediment supply to mudflats, marshes, and breached salt ponds surrounding San Francisco Bay (Bever et al. 2014). This work was presented to the U.S. Army Corps of Engineers (USACE) Coastal Engineering Research Board in September 2014. USACE has developed a framework support which supports the development of a four-element approach for implementation including: a) baseline monitoring; b) a small pilot study with tracers; c) modeling; and d) a demonstration project. The baseline monitoring will occur both prior to the pilot study and after the demonstration project. It will include monitoring of biologic and physical elements, such as benthic population and natural accretion rates. Modeling will be used to design a small-volume pilot study, and data collected during and after the pilot study will be used to validate the model. The pilot study will make use of tracers monitored during and following the placement to determine concentrations in the water column immediately following placement and determining the ultimate fate of placed material. The validated post-pilot study model will then be applied to plan the larger-volume demonstration project and validated using data collected during and after the demonstration project. The demonstration project will make use of standard size scows from a larger routine maintenance dredging project and will be coupled with repeated multi-beam surveys and extensive monitoring.

Table 1
Rough Order-of-Magnitude Costs

Project Elements	Rough Order-of-Magnitude Cost	Notes
Baseline Monitoring	$500,000	Pre-tracer study; Post-pilot
Tracer Study	$1,200,000	Independent mobilization of small scow
Modeling	$400,000	Pre-tracer Post-tracer study; Post-pilot
Small Pilot Project	$1,000,000	Scows from larger routine maintenance project
Total	**$3,100,000**	

Reference

Bever, A.J., M.L. MacWilliams, F. Wu, L. Andes, and C.S. Conner, 2014. "Numerical modeling of sediment dispersal following dredged material placements to examine the possible augmentation of the sediment supply to marshes and mudflats, San Francisco Bay, USA." *Proceedings of the 33rd PIANC World Congress*. Brussels, Belgium: PIANC; 18 p.

Appendix C
Letters of Support

Congress of the United States
Washington, DC 20515

March 8, 2017

Douglas Lamont
Senior Official Performing the Duties of the
Assistant Secretary of the Army (Civil Works)
U.S. Department of the Army
108 Army Pentagon, Room 3E446
Washington, DC 22202

Lieutenant General Semonite
Chief of Engineers
U.S. Army Corps of Engineers
441 G Street, NW
Washington, DC 20226

Dear Mr. Lamont and Lieutenant General Semonite:

We write to inform you of our strong interest and support for Section 1122 of the Water Infrastructure Improvements for the Nation (WIIN) Act and to request that you include the San Francisco Bay in the beneficial use pilot program provided for in the Act. We are also requesting that you select leadership from the California State Coastal Conservancy, the San Francisco Bay Conservation and Development Commission and the San Francisco Bay Regional Water Quality Control Board for the Regional Beneficial Use Team in our area.

Sec. 1122 established a 10-location pilot program to maximize the amount of material dredged by the Corps of Engineers (Corps) to be transported to nearby sites that need sediment. The material would be used to reduce potential storm damage, protect public safety, protect/restore/create wetlands, enhance shorelines, or for other purposes that fulfill public objectives. We believe that the Bay Area meets the goals and objectives of the beneficial use pilot program at the highest levels.

There is no place better suited to demonstrate the multiple benefits of beneficial use than the San Francisco Bay. The Corps currently has a significant operation and maintenance dredging program at the Ports of Oakland, Richmond, and Redwood City within the San Francisco Bay and the need for the dredged material is tremendous in the region. Our area offers a mix of opportunities to beneficially use dredged material, and a host of partners from state and local government, and private sector interests that are ready to work closely with the Corps. Besides the will, we have the means to cost-share with the important passage of a nine-county parcel tax this last summer to fund shoreline restoration projects.

We are looking forward to learning about your Implementation Guidance for Sec. 1122 and stand ready to assist in any way we can. We also want to work with you to ensure that your Operations and Maintenance budget is fully funded in order to allow for the beneficial use of sediment.

We thank you for your consideration of our requests and we are pleased to partner with you on what we believe will be a very successful program.

Sincerely,

JOHN GARAMENDI
Member of Congress

DIANNE FEINSTEIN
United States Senator

JARED HUFFMAN
Member of Congress

JACKIE SPEIER
Member of Congress

MARK DESAULNIER
Member of Congress

ANNA G. ESHOO
Member of Congress

BARBARA LEE
Member of Congress

RO KHANNA
Member of Congress

MIKE THOMPSON
Member of Congress

ERIC SWALWELL
Member of Congress

ZOE LOFGREN
Member of Congress

NANCY PELOSI
12TH DISTRICT, CALIFORNIA
DEMOCRATIC LEADER

233 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-0508
(202) 225-4965

Congress of the United States
House of Representatives
Washington, DC 20515-0508

DISTRICT OFFICE:
SAN FRANCISCO FEDERAL BUILDING
90-7TH STREET, SUITE 2-800
SAN FRANCISCO, CA 94103
(415) 556-4862
www.pelosi.house.gov

March 9, 2017

Douglas Lamont
Senior Official Performing the Duties of the
Assistant Secretary of the Army (Civil Works)
U.S. Department of the Army
108 Army Pentagon, Room 3E446
Washington, DC 22202

Lieutenant General Semonite
Chief of Engineers
U.S. Army Corps of Engineers
441 G Street, NW
Washington, DC 20226

Dear Mr. Lamont and Lieutenant General Semonite:

Thank you for your commitment to advance the quality of our nation's water infrastructure. I write today to join my California colleagues who recently wrote in support of including the San Francisco Bay Area as one of the beneficial reuse pilot programs established by the Water Infrastructure Improvements for the Nation (WIIN) Act.

As you know, the WIIN Act established ten pilot projects to maximize the amount of material dredged by the U.S. Army Corps of Engineers (Corps) to be transported to nearby sites in need of sediment. The material would be used to reduce potential storm damage, promote public safety, protect wetlands, enhance shorelines, and for other purposes that further public interests.

Without doubt, there is no place better suited to realize the various benefits of dredged sediment than the San Francisco Bay. The Corps has a history of proven partnerships with the San Francisco Bay and currently operates a significant operation and maintenance dredging program – all within the San Francisco Bay – at the Ports of Oakland, Richmond, and Redwood City. The San Francisco Bay has also demonstrated a strong ability to cost-share with the June 2016 passage of a nine-county parcel tax – raising $500 million dollars over the course of 20 years – to fund shoreline restoration projects. The need for the dredged material in the region is vital and the desire to work with the Corps on this endeavor is far-reaching. We must continue to build on our progress toward environmental conservation and the health of California's Bay Area.

Thank you for your consideration of my request. I look forward to working with you on the implementation of this new program.

best regards,

Nancy Pelosi

NANCY PELOSI
Member of Congress

Bay Planning Coalition

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

March 8, 2018

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

Bay Planning Coalition (BPC) supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

BPC is a nonprofit, member organization that advocates for sustainable commerce, industry, infrastructure, recreation and the natural environment connected to the San Francisco Bay and its watershed. Together with our nearly 150 member organizations, we work diligently to ensure, among other things, that land on the Bay is used wisely and developed in economically and environmentally sound ways.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to land subsidence, dredged material is sometimes necessary for successful restoration. The Sonoma Baylands Restoration Project and Hamilton Wetlands Restoration Project are two successful examples of restoration using dredged material in San Francisco Bay, through a partnership between the Corps and the Conservancy.

The Conservancy's proposal would cost-share an effort with the Corps to beneficially use a portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at in-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

On behalf of BPC's members, BPC is in support of this effort to increase the beneficial use of dredged material in San Francisco Bay to restore aquatic ecosystem habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the nation provided that it not reduce or remove any funding from the Corps' Operations and Maintenance (O&M) budget. O&M funds are vital to maintaining the Bay's shipping channels and any reduction in O&M budget would threaten the vitality of the Bay Area's shipping industry and the regional economy.

Sincerely,

Richard Sinkoff
President
Bay Planning Coalition

United States Department of the Interior
U. S. Fish and Wildlife Service
San Francisco Bay National Wildlife Refuge Complex
1 Marshland Road
Fremont, California, 94555

March 9, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers,
South Pacific Division 1455 Market Street
San Francisco, CA 94103 -1398

General Helmlinger,

Subject: Letter of Support for San Francisco Bay as a Beneficial Use Pilot Program

The United States Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge (NWR) Complex supports the inclusion of San Francisco and San Pablo Bays in the beneficial use of dredged material pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) Pilot Program proposal includes the beneficial use of dredged material from three major federal navigational dredge sites in San Francisco and San Pablo Bays. The Conservancy's Pilot Program includes four environmental restoration sites on the shoreline of San Francisco and San Pablo Bays: Montezuma, Bel Marin Keys Unit V, Eden Landing, or Cullinan Ranch – specifically, East Cullinan Ranch Unit of San Pablo Bay NWR. The San Francisco Bay NWR Complex has been a long-term partner with the Conservancy. Forging and maintaining these partnerships is a critical step towards the accomplishment of conservation actions recommended in regional plans such as the Tidal Marsh Species Recovery Plan and the Baylands Ecosystem Habitat Goals (BEHG) Project, as well as the BEHG Update for Climate Change.

The San Francisco Bay NWR Complex is part of a system of 566 National Wildlife Refuges across the United States and territories. Part of the mission of the National Wildlife Refuge System is to restore fish and wildlife habitats within these refuges for the benefit of species conservation. Beneficial use of dredge material has proven quite effective in the restoration of former farmland back to tidal wetland habitat.

Tidal wetlands around San Francisco and San Pablo Bays provide multiple benefits - wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, improved water quality, and recreation and open space for the millions of people who live in the Bay Area. San Francisco and San Pablo Bays have lost approximately 85% of these tidal wetlands. Many of these lands are now being restored back to tidal wetlands by local, state, and federal agencies, nonprofits, and private partners. However, due to land subsidence, a consequence of draining wetlands for farmable land, dredged material is often necessary for successful restoration.

In the late 1990's the Sonoma Baylands Wetland Demonstration Project was an effort by the Corps, the Port of Oakland, and the Conservancy, partnering with a consortium environmental agencies and nonprofits, to demonstrate that reused dredge was beneficial in the restoration of tidal marsh. Today, the 322 acre restoration of the Sonoma Baylands Unit of San Pablo Bay NWR supports one of the highest densities of endangered Ridgway's rails in the Bay Area.

Beneficial reuse of dredged material is a necessary component to expedite the restoration of tidal wetlands. The completed Hamilton Wetlands Restoration Project and the ongoing East Cullinan Ranch Restoration Project are great examples of restorations benefiting from reused dredge material.

The Conservancy's Pilot Program proposal would cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels.

The San Francisco Bay NWR Complex fully supports this Pilot Program to increase the beneficial use of dredged material in San Francisco and San Pablo Bays to restore tidal wetland habitats and increase shoreline resilience while concurrently protecting the marine and deep bay ecosystem. We encourage you to recommend the Conservancy's San Francisco Bay Pilot Program to Corps Headquarters as one of the ten pilot programs to be selected from around the Nation.

Sincerely,

Christopher J. Barr, Deputy Complex Manager
San Francisco Bay National Wildlife Refuge Complex
United States Fish and Wildlife Service

Western Regional Office
3074 Gold Canal Drive
Rancho Cordova, CA 95670-6116
(916) 852-2000 fax (916) 852-2200
www.ducks.org

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

March 8, 2018

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

Ducks Unlimited, Inc. supports the inclusion of San Francisco Bay in the beneficial use of dredged material pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use to further wetland restoration.

Ducks Unlimited is our country's oldest wetlands conservation organization. Our mission is to conserve, restore, and manage wetlands and associated habitats for North America's waterfowl, other wildlife, and people. Conservation priorities are set nationally, regionally, and locally to reflect wildlife, habitat, and human needs at each of those levels. Ducks Unlimited has been conserving coastal wetlands in our San Francisco Bay priority area for over 20 years, and views beneficial reuse of dredged material as one of the single most important actions to ensure resilience of the bay's wetlands into the future.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to land subsidence, dredged material is often necessary for successful restoration.

Ducks Unlimited supports the incorporation of beneficial reuse of dredged material in San Francisco Bay wetland restoration projects. The Cullinan Ranch project, which Ducks Unlimited currently manages in partnership with the US Fish and Wildlife Service, is an excellent example of how beneficial reuse of dredged material is the necessary component to meet project goals. The Hamilton Wetlands Restoration Project, managed by the Coastal Conservancy, is an excellent recent example of a successfully completed beneficial reuse-based, wetland restoration project.

Ducks Unlimited fully supports this effort by the Conservancy to increase the beneficial reuse of dredged material in San Francisco Bay to restore aquatic ecosystem habitats and increase shoreline resilience.

Sincerely,

Mark E. Biddlecomb
Director, Western Regional Office

MONTEZUMA WETLANDS LLC
A joint venture of
Levine•Fricke Restoration Corp.
and the Zebra Funds

February 27, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

Montezuma Wetlands LLC supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) is submitting a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay. Montezuma Wetlands is the owner and operator of one of those sites, the Montezuma Wetlands Restoration site in Solano County.

Montezuma Wetlands was a successful partner with the Corps of Engineers on the Oakland 50-foot deepening project, and we have successfully received sediments from Corps' maintenance projects over a dozen times.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to land subsidence, dredged material is sometimes necessary for successful restoration.

The Conservancy's proposal is to cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at In-Bay disposal sites, the Corps would place it at one of four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

2000 Powell Street, Suite 920
Emeryville, California 94608-1888
510.350.4100 • Fax 510.594.1512

Building upon all of the work the Corps and state agencies have done over the past decade, beneficial reuse of sediments can be accomplished quite efficiently in the SF Bay Area. Many of the permits and site improvements are already in place, as well as rapid offloading capacity through our regional offloader, the Liberty. As you know, the Liberty has already been used at Montezuma, Hamilton, Sonoma Baylands, and Galbrath golf course, and it would be feasible to deploy it at Bel Marin Keys and Eden Landing, if the Conservancy so desires.

Montezuma Wetlands LLC fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore habitats, increase shoreline resilience, and build upon the work this region has already done. Given our head start in this program, the SF Bay Area could help the Corps demonstrate early success. The proposed team (Conservancy, Corps, Montezuma, Ducks Unlimited, and others) have already developed successful working relationships, and this should give you comfort that we will achieve results in the field, on time and within the budgets provided. The Sonoma Baylands Restoration Project and Hamilton Wetlands Restoration Project are two successful examples of restoration using dredged material in San Francisco Bay, through a partnership between the Corps and Conservancy.

We therefore encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters, and help this coalition emerge as one of the ten selected pilot programs around the Nation.

Sincerely,

James D. Levine, P.E.
Managing
Montezuma Wetlands LLC

State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500
www.wildlife.ca.gov

EDMUND G. BROWN JR., *Governor*
CHARLTON H. BONHAM, *Director*

March 8, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Dear General Helmlinger:

Subject: Letter of Support for San Francisco Bay as a Beneficial Use Pilot Program

The California Department of Fish and Wildlife (CDFW) supports the inclusion of San Francisco Bay in the beneficial use pilot program (Pilot Program) being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act (WRDA). The California State Coastal Conservancy (Conservancy) Pilot Program proposal includes the beneficial use of dredged material from three major federal navigational dredge sites in San Francisco Bay. The Conservancy's Pilot Program includes four environmental restoration sites on the shoreline of San Francisco Bay, including CDFW lands known as Eden Landing Ecological Reserve (Eden Landing).

The Pilot Program would be part of Phase 2 of the South Bay Salt Pond Restoration Project (SBSPRP), the largest tidal restoration project on the west coast of the United States. CDFW owns and manages Eden Landing and has been a long-term partner with the SBSPRP and the Conservancy. A Pilot Program at Eden Landing is another critical step towards the accomplishment of conservation actions recommended in regional plans such as the Tidal Marsh Species Recovery Plan and the Baylands Ecosystem Habitat Goals (BEHG) Project, as well as the BEHG Update for Climate Change.

Tidal wetlands around San Francisco Bay provide multiple benefits including wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation for over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay has lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to historic and ongoing land subsidence in conjunction with sea level rise, beneficial use of dredged material may be necessary to enable successful restoration. The Sonoma Baylands and Hamilton Wetlands Restoration Projects are two examples of successful restoration using dredged material in San Francisco Bay, which were accomplished through partnership between the Corps and the Conservancy.

The Conservancy's Pilot Program proposal would cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at in-Bay disposal sites, the Corps would place it at one to four tidal wetland restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

CDFW fully supports this Pilot Program to increase the beneficial use of dredged material in San Francisco Bay to restore wetland habitats and increase shoreline resilience while concurrently protecting the marine and deep bay ecosystem. We encourage you to recommend the Conservancy's San Francisco Bay Pilot Program to Corps Headquarters as one of the ten pilot programs to be selected from around the Nation.

CDFW looks forward to implementing a successful Pilot Program in cooperation with the Corps and the Conservancy and fully supports the Conservancy in it's role as state lead in planning this effort. If you have any questions, please contact Mr. John Krause, Environmental Scientist, at john.krause@wildlife.ca.gov or (415) 454-8050; or Mr. Conrad Jones, Senior Environmental Scientist (Supervisory), at conrad.jones@wildlife.ca.gov or (707) 576-2836.

Sincerely,

Gregg Erickson
Regional Manager
Bay Delta Region

PORT OF OAKLAND

March 5, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program, WRDA Section 1122

Dear General Helmlinger:

On behalf of the Port of Oakland ("Port"), I would like to offer my support for the inclusion of the San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers ("Corps") pursuant to Section 1122 of the Water Resources Development Act. I understand that the California State Coastal Conservancy ("Conservancy") has submitted a proposal for a pilot program that includes the beneficial reuse of dredged material from three major federal navigational channels in the San Francisco Bay, including the Oakland Harbor, for beneficial use at four existing and prospective environmental restoration sites on the shoreline of the Bay. We hope that such a pilot program initiation can provide valuable insights on how the Corps can fulfill their primary mission to ensure the safe and navigable use of commercial waterways while at the same time providing ancillary benefits through the cost-effective reuse of a portion of the dredged material.

As one of the nation's busiest container seaports and as the destination for 99 percent of the region's containerized imports and exports, the Port of Oakland is a vital part of the Bay Area's thriving economy. The Port is therefore dependent on the ability of the Corps to efficiently and regularly maintain the federal navigation channels that provide access for the nearly 2,000 container ships that call on the Port every year.

The Port also supports, in partnership with the Corps and a host of resource agency, nonprofit, and private partners, the ability to cost-effectively reuse dredged materials where appropriate and feasible within the San Francisco Bay ecosystem. The maintenance and restoration of tidal wetlands in and around the San Francisco Bay can provide multiple benefits through increased shoreline resiliency, improved water quality, and enhanced wildlife habitat, among other attributes. The increased focus and attention that the residents of the Bay Area have given to this issue, including approving locally-imposed tax dollars to support these initiatives, provides an opportunity for unique partnerships such as the one proposed by the Conservancy.

530 Water Street ■ Jack London Square ■ P.O. Box 2064 ■ Oakland, California 94604-2064
Telephone: (510) 627-1100 ■ Facsimile: (510) 627-1826 ■ Web Page: www.portofoakland.com

I understand that the Conservancy has proposed a partnership with the Corps to beneficially reuse a portion of the material dredged annually from the Oakland Harbor, Richmond Harbor, and Redwood City Harbor federal navigation channels. This pilot project effort would then place the material at one or more of the current and/or prospective agency-approved tidal wetlands restoration sites located around the San Francisco Bay. The Port supports this pilot project endeavor and the potential that it might have to increase the beneficial reuse options within the Bay, reduce the current cost of beneficial reuse of dredged material, and most importantly make this activity more cost-comparable to currently authorized disposal options. I also understand the inclusion in this pilot program would not reduce the annual federally-authorized Operations & Maintenance funding that will be appropriated to the Corp's San Francisco District for currently-authorized and critical navigation programs.

We appreciate the Corps' consideration and support of this pilot project application, and appreciate the continued partnership with you on this and other issues. Please do not hesitate to contact me if I might be of assistance to you while this application is under review. I can be reached at (510) 627-1210 or email clytle@portoakland.com.

Sincerely,

J. Christopher Lytle
Executive Director

PORT OF REDWOOD CITY
Serving Silicon Valley

675 Seaport Boulevard
Redwood City, California 94063-5568
650 306 4150 FAX 650 369 7636
E-mail: portofrc@redwoodcityport.com

March 8, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

The Port of Redwood City (RWC) supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the use of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

The Port of RWC is the only deepwater port in south San Francisco Bay. It is projected to handle over 2 million metric tons of annual cargo by July 1, 2018 carried in over 60 ocean going ships. The majority of this cargo goes to support the construction industry in the economically important and growing Silicon Valley.

The Port's Redwood City Harbor federal navigation channel is adjacent to the Don Edwards South SF Bay National Wildlife Refuge. Dredged material from the channel contributed to restoration of tidal marsh on the Refuge's Inner Bair Island.

One of the sites for restoration using dredged material in the proposed Section 1122 Pilot Project is Eden Landing which is located within close proximity to the Redwood City Harbor. Eden Landing is one of three salt pond complexes that is included in the South Bay Salt Pond Restoration Project, managed by the California State Coastal Conservancy. The Eden Landing beneficial use site offers a great opportunity to use large volumes of dredged material for marsh restoration, flood risk management, adaptation to sea level rise, and open space in the south Bay.

It is our understanding that the Conservancy's proposal is to cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at In-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

PORT OF REDWOOD CITY
Serving Silicon Valley

The Port of Redwood City fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the Nation.

Please call on the Port RWC to discuss our recommendations for beneficial use in more detail as needed. We would welcome the discussion.

Sincerely yours,

Michael J. Giari
Executive Director
Port of Redwood City
Phone: (650) 306-4150
E-Mail: mgiari@redwoodcityport.com

March 7, 2018
CIWQS Place ID 815808

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger:

The San Francisco Bay Regional Water Quality Control Board (Regional Water Board) supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

Under the federal Clean Water Act, all dredging and sediment disposal or beneficial reuse activity in San Francisco Bay, its marshes, and its tributary creeks requires regulatory action by the Regional Water Board. The Board must certify that dredging and wetland fill projects requiring federal permits meet state water quality standards. The Regional Water Board works with its federal, state, and local partners in the Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS) to manage navigational dredging and disposal activities in the Bay Area. The navigational dredging program is included in the San Francisco Bay Basin Plan's Implementation Program.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay has lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to land subsidence, dredged material is frequently necessary for successful restoration. The Sonoma Baylands Restoration Project and the Hamilton Wetlands Restoration Project are two successful examples of restoration using dredged material in San Francisco Bay, through a partnership between the Corps and the Conservancy.

The Conservancy's proposal would cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor, and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site in the Pacific Ocean or at in-Bay disposal sites, the Corps would place it at one to four tidal wetland restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

The Regional Water Board fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore aquatic ecosystem habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten beneficial reuse pilot programs implemented around the Nation.

Do not hesitate to contact me at 510-622-2314 or bwolfe@waterboards.ca.gov should you have questions.

Sincerely,

Bruce H. Wolfe
Executive Officer

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

March 12, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers
South Pacific Division
1455 Market Street
San Francisco, California 94103-1398

Re: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger:

This letter is to express NOAA's National Marine Fisheries Service's (NMFS) support for the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. In response to the Corps' request for proposals published in the Federal Register on February 9, 2018 (83 FR 5763), the California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

NMFS is responsible for the stewardship of the nation's living marine resources and their habitats. Our work is guided by two core mandates - to ensure the productivity and sustainability of fisheries and fishing communities through science-based decision-making and compliance with regulations, and to recover and conserve protected resources including whales, turtles, and salmon. These responsibilities include the management of marine and anadromous fish species listed under the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*) as well as implementation of the essential fish habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801-1882).

San Francisco Bay (Bay) and tidal wetlands around the Bay provide vital habitat for five listed anadromous fish species[1] and portions of the Bay are designated as critical habitat. The Bay is also designated as essential fish habitat for various life stages of fish species managed under the following federal fisheries management plans: Pacific Groundfish, Coastal Pelagic, and Pacific Salmon. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to land subsidence,

[1] Endangered Sacramento River winter-run Chinook, threatened Central Valley spring-run Chinook, threatened California Central Valley steelhead, threatened Central California Coast steelhead, and threatened southern distinct population segment of North American green sturgeon.

dredged material is sometimes necessary for successful restoration. The Sonoma Baylands Restoration Project and Hamilton Wetlands Restoration Project are two successful examples of restoration using dredged material in San Francisco Bay, through a partnership between the Corps and the Conservancy.

The Conservancy's proposal would cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor, and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at in-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma Wetlands, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

NMFS fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore aquatic ecosystem habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the Nation.

If you have questions concerning these comments, please contact Sara Azat at 707-575-6067 or sara.azat@noaa.gov.

Sincerely,

Gary Stern
San Francisco Bay Branch Chief
California Coastal Office

cc: Naomi Ferger, SF Regional Water Board, Oakland, CA
Elizabeth Christian, SF Regional Water Board, Oakland, CA
Brenda Goeden, BCDC, San Francisco, CA
Amy Hutzel, SCC, Oakland, CA
Copy to Chron File

March 6, 2018

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Re: San Francisco Bay Beneficial Use Pilot Program – SUPPORT

Dear General Helmlinger:

On behalf of Save The Bay's 60,000 supporters throughout the Bay Area, I write in strong support of including San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Infrastructure Improvements for the Nation Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

Healthy wetlands provide important ecological benefits, and restoration often requires the use of dredged sediment. Over the last 16 years, the Bay Area has used 23 million cubic yards of dredged sediment for this work. From existing projects, agencies have noticed that restoration sites using dredged sediment – instead of natural sedimentation – have a much greater and quicker success rate for habitat development. A site that received dredged sediment creates an actual marsh in about 10-15 years versus 50-60 years for natural sedimentation. Increasing the quality and quantity of wetlands around the Bay will provide measurable benefits to the people and wildlife that call the Bay Area home.

The Conservancy's proposal would share cost with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor, and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at in-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

Save The Bay fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore fish and wildlife habitat and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the nation.

Sincerely,

David Lewis
Executive Director
Save The Bay

CITIZENS COMMITTEE TO COMPLETE THE REFUGE

453 Tennessee Lane, Palo Alto, CA 94306 Tel: 650-493-5540 www.bayrefuge.org cccrrefuge@gmail.com

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

March 5, 2018

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

The Citizens Committee to Complete the Refuge is writing in support of the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

The Citizens Committee to Complete the Refuge (CCCR), consisting of 2,000 members, has an ongoing history of interest in wetland protection, wetland restoration and wetland acquisition. As such, CCCR has taken an active interest in Clean Water Act (CWA) regulations, policies, implementation and enforcement. We have established a record of providing information regarding possible CWA violations to both the Corps and EPA. We regularly respond to Corps public notices, and inform the public of important local CWA issues. We have been involved as stakeholders for the South Bay Salt Pond Restoration Project. We have commented on the Montezuma Wetlands Project, the Cullinan Ranch Project and the Eden Landing Project. We recognize the challenges posed by subsidence for tidal marsh restoration projects.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. CCCR has submitted comments on the South Bay Salt Pond Restoration Project. Our comment letter for Phase I of the South Bay Salt Pond Restoration Project described alternatives that included the beneficial reuse of dredge material. The Sonoma Baylands Restoration Project and Hamilton Wetlands Restoration Project are two successful examples of restoration projects using dredged material in San Francisco Bay, through a partnership between the Corps and the Conservancy.

The Conservancy's proposal would cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at in-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

The Citizens Committee to Complete the Refuge fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore aquatic ecosystem habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the Nation.

Sincerely,

Carin High

Carin High
CCCR Co-Chair

SAN FRANCISCO
BAYKEEPER®

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

San Francisco Baykeeper supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay.

Baykeeper and our over five thousand members and supporters who use and enjoy the environmental, recreational, and aesthetic qualities of San Francisco Bay fully support the wider adoption of appropriate dredged sediments to restore wetland ecosystems. We have long-supported the modernization of sediment management efforts and recognize the Corps, as the largest dredger in our region and most others throughout the Nation, plays a critical role in utilizing dredged material for sustainable and beneficial purposes. This pilot program represents a meaningful step forward and inclusion of San Francisco Bay, as a significant urban estuary with meaningful opportunities for beneficial reuse, is an ideal location for pilot efforts.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. However, due to land subsidence, dredged material is sometimes necessary for successful restoration. The Sonoma Baylands Restoration Project and Hamilton Wetlands Restoration Project are two successful examples of restoration using dredged material in San Francisco Bay, through a partnership between the Corps and the Conservancy.

The Conservancy's proposal would cost share an effort with the Corps to beneficially use a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at in-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, or Eden Landing.

Baykeeper fully supports this effort to increase the beneficial use of dredged material in San Francisco Bay to restore aquatic ecosystem habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the Nation.

Sincerely,

Ian Wren
Staff Scientist, San Francisco Baykeeper

SCAPE / LANDSCAPE ARCHITECTURE DPC
277 BROADWAY SUITE 1606 NEW YORK NY 10007
T 212 462 2628 F 212 462 4164
SCAPESTUDIO.COM

Brigadier General D. Peter Helmlinger, Commander
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street
San Francisco, CA 94103-1398

Subject: Support for San Francisco Bay as a Beneficial Use Pilot Program

Dear General Helmlinger,

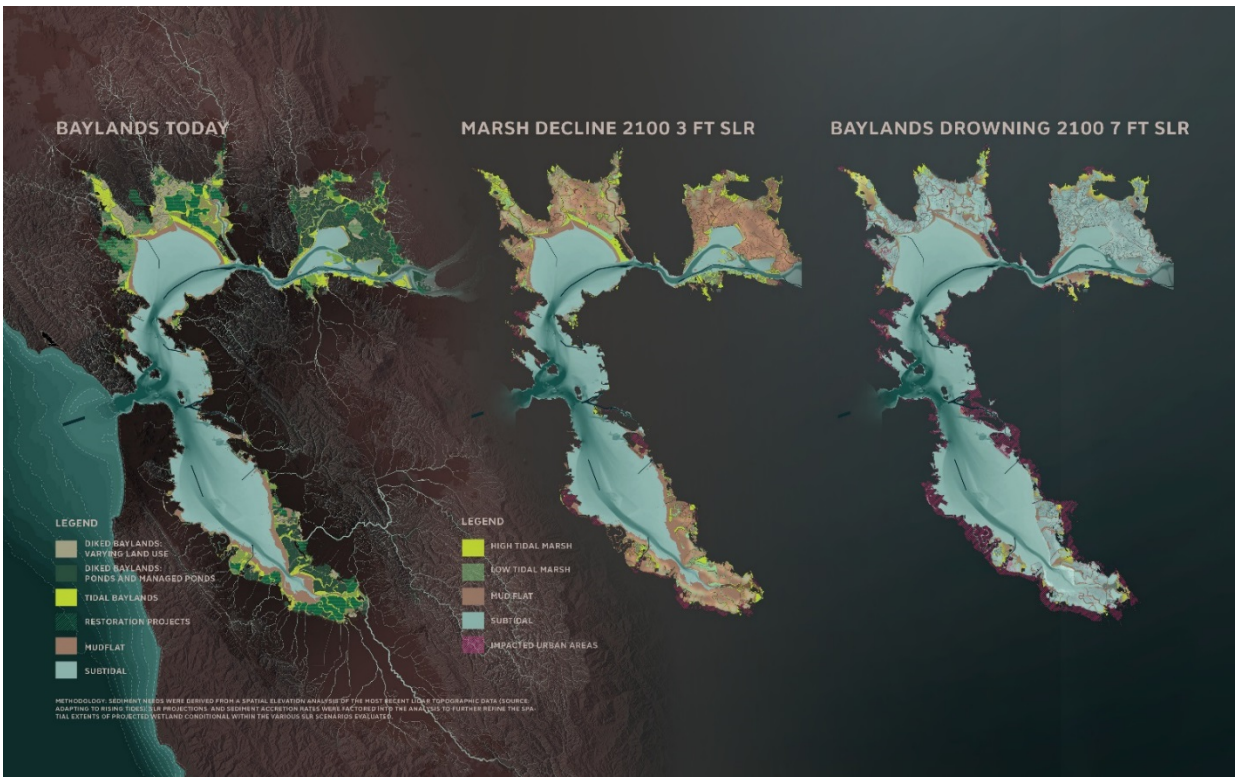
The Public Sediment team strongly supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay. **The team particularly supports the expansion of the proposal to include in-bay placement and strategic placement strategies in the South Bay, as these projects have great potential to deliver sediment to existing mudflats and marshes vulnerable to drowning over time with sea level rise.**

The Public Sediment team is composed of national and Bay-area design and engineering firms, academic groups, and non-profit organizations and was formed for the regional resilience design challenge, Resilient By Design. The team is led by SCAPE Landscape Architecture, with the Dredge Research Collaborative, Arcadis, UC Davis Department of Human Ecology and Department of Design, TS Studio, and the Architectural Ecologies Lab. Resilient by Design is a year-long collaborative design challenge bringing together local residents, public officials and local, national and international experts to develop 10 innovative designs around the Bay Area that will strengthen the region's resilience to sea level rise, severe storms, flooding and earthquakes. Alameda Creek Watershed has been selected as one of the 10 resilience sites.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands. Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. Dredge material can play a key role in successful restoration and more pilots studies are needed to expand the range of placement types and sites, both in the wetland edges and in the Bay itself. Piloting, along with careful monitoring, is also needed to make beneficial reuse more cost effective, less logistically complex, and understand its short term and long term environmental impacts.

SCAPE / LANDSCAPE ARCHITECTURE DPC
277 BROADWAY SUITE 1606 NEW YORK NY 10007
T 212 462 2628 F 212 462 4164
SCAPESTUDIO.COM

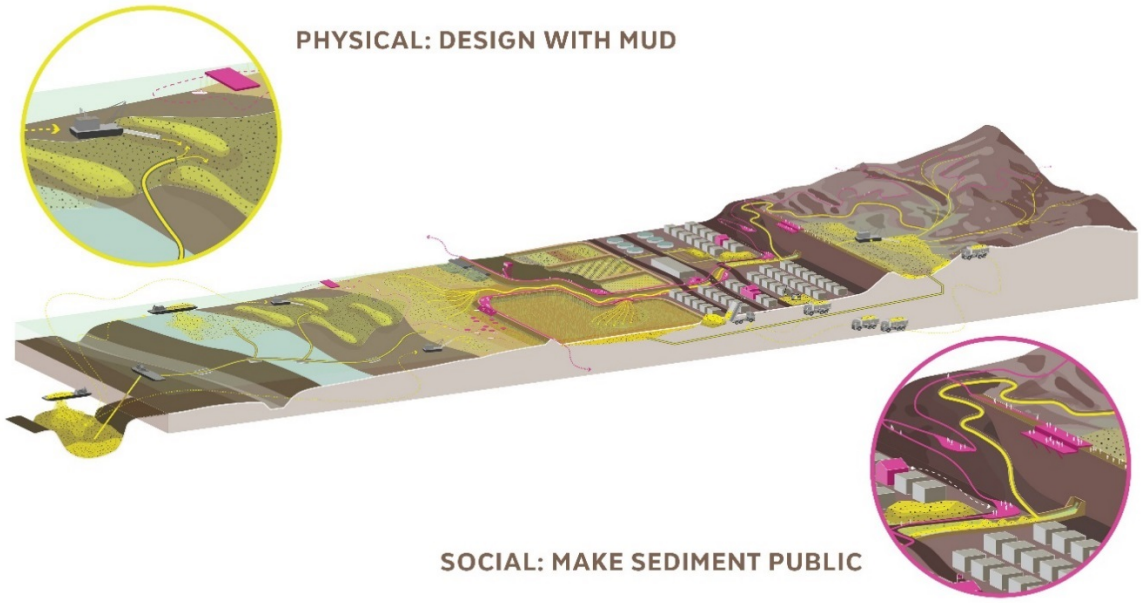
The California State Coastal Conservancy's proposal to the Corps is to cost-share the beneficial use of a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at In-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, and Eden Landing, and also **test new in-bay beneficial use sites that could potentially feed existing and restored wetlands in the future.**



Our team advocates for the piloting of multiple beneficial reuse techniques, including in-Bay strategic placement of dredge material. The time for testing is now. With high rates of sea level rise, a recent study in Science Advances projects that "100% of high and middle marsh habitats are lost in the next century, with 83% of current tidal wetlands transitioning to unvegetated habitat… With low vertical accretion rates and little upland migration space, pacific coast tidal wetlands are at imminent risk of submergence with

SCAPE / LANDSCAPE ARCHITECTURE DPC
277 BROADWAY SUITE 1606 NEW YORK NY 10007
T 212 462 2628 F 212 462 4164
SCAPESTUDIO.COM

projected rates of rapid SLR." [1] The practices, technologies, and regulations around beneficial reuse must adapt to the pace of sea level rise. It is critical that we pilot now, to have physical strategies and regulatory frameworks in place to respond to higher scenarios of sea level rise. Strategic placement pilots will take time to permit, to deploy, to monitor, and to fully analyze the conclusions – we must not start too late.



Public Sediment Concept Diagram*: The Public Sediment Team / SCAPE Research Report for Resilient By Design.*

Our team is working across disciplines to study new sediment management practices in the Bay Area and consider the planning and management of sediment flows holistically, as an interconnected system that spans uplands and lowlands, incorporating natural processes and human inputs. **The Conservancy's proposal aligns closely with the Public Sediment goals- to design with mud for a more resilient Bay, and to make sediment a valued and understood public resource.**

The Public Sediment team fully supports the Conservancy's effort to increase the beneficial use of dredged material in San Francisco Bay to restore habitats and increase shoreline resilience. We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the Nation.

---

[1] Thorne, Karen, et al. "U.S. Pacific Coastal Wetland Resilience and Vulnerability to Sea-Level Rise." *Science Advances*, American Association for the Advancement of Science, 1 Feb. 2018, http://advances.sciencemag.org/content/4/2/eaao3270

SCAPE / LANDSCAPE ARCHITECTURE DPC
277 BROADWAY SUITE 1606 NEW YORK NY 10007
T 212 462 2628 F 212 462 4164
SCAPESTUDIO.COM

Sincerely,

Gena Wirth
SCAPE Landscape Architecture

Brett Milligan
Dredge Research Collaborative

Adam Marcus
Architectural Ecologies Lab

Christopher Devick
Arcadis

Brett Snyder
UC Davis Department of Human Ecology and Department of Design

Lee Wright
TS Studio

Dredge Research Collaborative

Brigadier General D. Peter Helmlinger, Commander

U.S. Army Corps of Engineers, South Pacific Division

1455 Market Street

San Francisco, CA 94103-1398

Subject: **Support for San Francisco Bay as a Beneficial Use Pilot Program**

Dear General Helmlinger,

The Dredge Research Collaborative strongly supports the inclusion of San Francisco Bay in the beneficial use pilot program being established by the U.S. Army Corps of Engineers (Corps) pursuant to Section 1122 of the Water Resources Development Act. The California State Coastal Conservancy (Conservancy) has submitted a proposal for a pilot program that includes the reuse of dredged material from three major federal navigational dredge sites in San Francisco Bay for beneficial use at four environmental restoration sites on the shoreline of San Francisco Bay. **The team particularly supports the expansion of the proposal to include in-bay placement and strategic placement strategies in the South Bay, as these projects have great potential to deliver sediment to existing mudflats and marshes vulnerable to drowning over time with sea level rise.**

The Dredge Research Collaborative, Incorporated (founded 2012, incorporated 2015) is formed for the purpose of furthering the study of the human manipulation of sediment. The DRC does this by conducting design research; hosting public events that facilitate interdisciplinary relationships between designers, scientists, corporate practitioners, and government agencies; consulting on real and speculative design projects; publishing literature and exhibits; and involving the public in wider conversations on the impact and value of sedimentary design. The Dredge Research Collaborative is composed of design practitioners, academics and writers that work collaboratively to investigate human sediment handling practices, dredging, and erosion control as a form of often unacknowledged landscape architecture.

Tidal wetlands around San Francisco Bay provide multiple benefits – wildlife habitat, fish nurseries, local coastal flood risk management, enhanced shoreline resilience, increased water quality, and recreation and open space for the over 7 million people who live in the Bay Area. Over the last two centuries, San Francisco Bay lost approximately 85% of its tidal wetlands.

Dredge Research Collaborative

Many of these lands are now being restored to tidal wetlands by local, state, and federal public agencies, nonprofits, and private partners. Dredge material can play a key role in successful restoration and more pilots studies are needed to expand the range of placement types and sites, both in the wetland edges and in the Bay itself.

The California State Coastal Conservancy's proposal to the Corps is to cost-share the beneficial use of a significant portion of the approximately 1.5 million cubic yards of material dredged annually from the Oakland Harbor, Richmond Harbor and Redwood City Harbor federal navigation channels. Instead of depositing the dredged material at the Deep Ocean Disposal Site or at In-Bay disposal sites, the Corps would place it at one to four tidal wetlands restoration sites around San Francisco Bay: Montezuma, Cullinan Ranch, Bel Marin Keys Unit V, and Eden Landing, **and also test new in-bay beneficial use sites that could potentially feed existing and restored wetlands in the future.**

The Dredge Research Collaborative strongly supports these efforts and advocates for the piloting of multiple beneficial reuse techniques, including strategic placement of dredge material in the Bay. With high rates of sea level rise, a recent study in Science Advances projects that "100% of high and middle marsh habitats are lost in the next century, with 83% of current tidal wetlands transitioning to unvegetated habitat… With low vertical accretion rates and little upland migration space, pacific coast tidal wetlands are at imminent risk of submergence with projected rates of rapid SLR.[1]" The practices, technologies, and regulations around beneficial reuse must adapt to the pace of sea level rise. It is critical that we pilot now, to have physical strategies and regulatory frameworks in place to respond to higher scenarios of sea level rise. Strategic placement pilots will take time to permit, to deploy, to monitor, and to fully analyze the conclusions – design and development of these ideas is critical for adaptation and Bay Area resilience.

Collaborative workshop at USACE Vicksburg ERDC facility. July 2018. Image Credit: DRC

[1] Thorne, Karen, et al. "U.S. Pacific Coastal Wetland Resilience and Vulnerability to Sea-Level Rise." *Science Advances*, American Association for the Advancement of Science, 1 Feb. 2018, http://advances.sciencemag.org/content/4/2/eaao3270

Dredge Research Collaborative

The Dredge Research Collaborative believes that designers should play a critical role in the design, development, and monitoring of beneficial use projects, particularly projects in highly urbanized areas like the San Francisco Bay. To further explore design/engineering collaborations on nature-based infrastructure, including the beneficial use of dredge material, the US Army Corps of Engineers (USACE), the Dredge Research Collaborative (DRC) and a diverse group of landscape architects (LA) held an Engineering with Nature (EWN) workshop at the US Army's Engineer Research and Development Center in Vicksburg, MS in July 2018. The workshop introduced the respective communities and offered an opportunity to identify potential working relationships. Specifically, participants explored potential collaborations through discussions and exercises that prioritized EWN approaches for new and/or existing water infrastructure projects and operations. Throughout the meeting, participants developed and refined ideas that established/integrated EWN approaches and designs into water dependent projects. Ultimately, workshop participants were able to define more than 40 clear, prioritized activities that will form the basis for future collaboration. **The Conservancy's proposal for a regional suite of beneficial use projects is complimentary to the discussion and vision realized at the Engineering with Nature workshop.**

Collaborative workshop at USACE Vicksburg ERDC facility. July 2018. Image Credit: DRC

The Conservancy's proposal aligns closely with the Dredge Research Collaborative's goals- to value sediment and dredge material as a resource, to engage designers in management of sediment systems, and to explore new methods of designing and managing sediment to adapt to a changing climate. The DRC fully supports the Conservancy's effort to increase the beneficial use of dredged material in San Francisco Bay to restore habitats and increase shoreline resilience. **We encourage you to recommend the Conservancy's San Francisco Bay project to Corps Headquarters as one of the ten pilot programs around the Nation.**

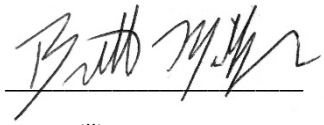
Dredge Research Collaborative

Sincerely,

The Dredge Research Collaborative

Justine Holzman

Dredge Research Collaborative / University of Toronto



Brett Milligan

Dredge Research Collaborative / UC Davis Department of Human Ecology

Gena Wirth

Dredge Research Collaborative / SCAPE Landscape Architecture

Rob Holmes

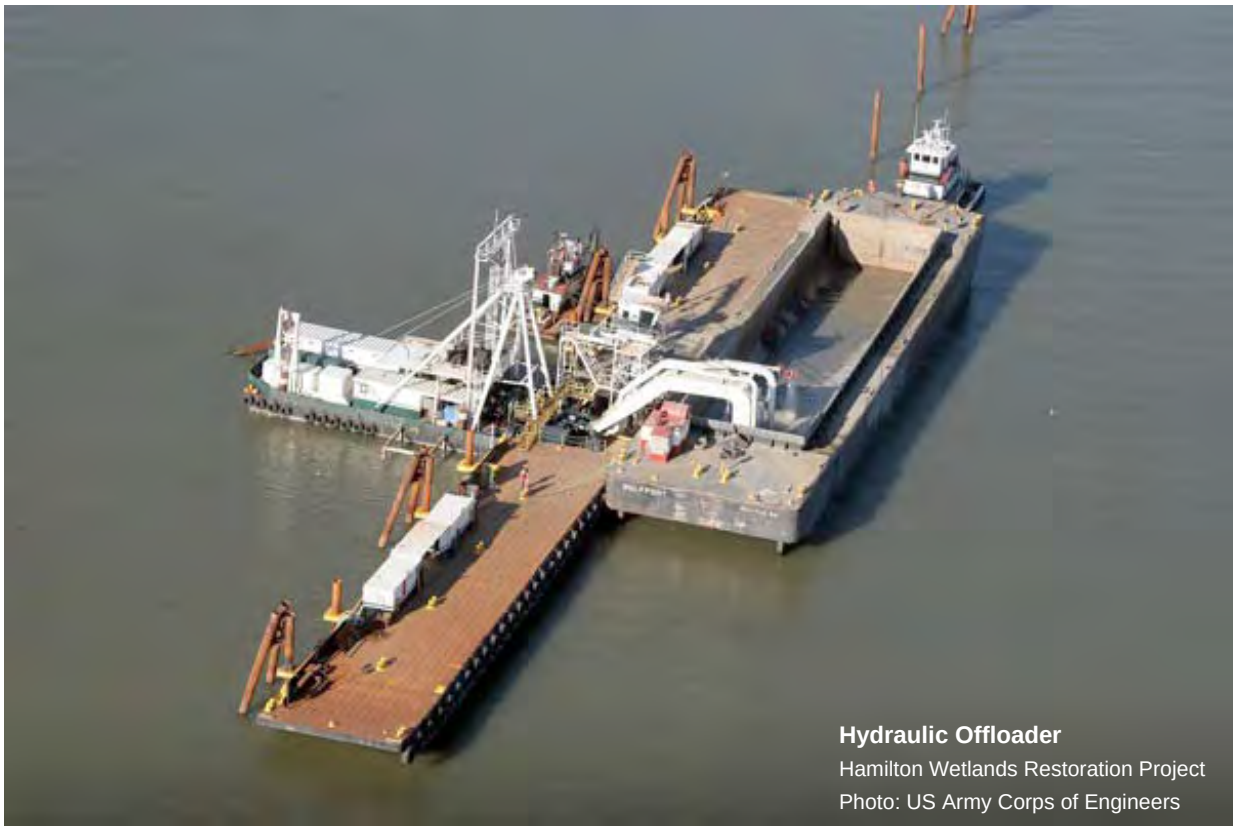
Dredge Research Collaborative / SCAPE Landscape Architecture

Appendix D
South Bay Salt Pond Restoration Project
Beneficial Reuse Feasibility Study
Conceptual Cost Estimate

South Bay Salt Pond Restoration Project

Beneficial Reuse Feasibility Study

Conceptual Cost Estimate



Hydraulic Offloader
Hamilton Wetlands Restoration Project
Photo: US Army Corps of Engineers

Prepared for:

Coastal Conservancy
1330 Broadway, 13th Floor
Oakland, CA 94612

Prepared by:

moffatt & nichol
2185 No California Blvd., Ste 500
Walnut Creek, CA 94596

October 15, 2014
M&N Job No: 7794

CONTENTS

TABLES

FIGURES

ATTACHMENTS

1. INTRODUCTION

1.1 Background

This report presents a concept-level cost analysis of beneficial reuse of dredged material at the South Bay Salt Pond (SBSP) Restoration Project. Four placement sites were defined for the purpose of the analysis, each consisting of groups of nearby ponds as shown in Figure 1.1:

A. Eden Landing Complex - E1, E2, E4, E5, E6, E7, E1C, E2C, E4C, E5C, and E6C
B. Alviso Complex – A1 and A2W
C. Alviso Complex – A5, A7, A8, A8S
D. Alviso Complex – A9, A10, A11, A12, A13, A14, A15

1.2 Scope of Work

This work was performed by Moffatt & Nichol (M&N) under contract to the California State Coastal Conservancy (CSCC). The scope of this specific cost analysis task includes the following:

- Refine a dredged material source list and volumes based on Dredged Material Management Office (DMMO) annual reports and prior M&N work for the CSCC and U.S. Army Corps of Engineers (USACE).
- Obtain dredging and transport costs for the Federal Oakland, Richmond, and Redwood City O&M Projects.
- Identify SBSP Restoration Project pond placement sites and capacities for raising pond bottom elevations with dredged material
- Perform a cost estimate including initial capital costs and annual operational costs for a hypothetical beneficial reuse project placing a minimum of 4 million cubic yards (MCY).
- Compare total beneficial reuse costs (dredging, transport, and tipping fees) to the USACE Federal Standard costs (determined from historic costs).
- Provide recommendations, or options, for the roles and responsibilities of the dredge contractors, third party offloading contractor, and Owner responsibilities for beneficially reusing dredged material.

2. METHODOLOGY

2.1 General Assumptions

Each of the four placement sites was considered separately. At each site, a third party contractor[1] was assumed to win a competitive contract to construct the infrastructure needed and operate the site until the placement site was filled. The contractor's work would include preparation of the placement site to receive dredged material via pipeline.

This estimate assumes one mobilization and demobilization of capital infrastructure including mooring dolphins and a pipeline (submerged and on land). Pipeline distances were estimated from the offloader location to the centroid of the placement site. Once installed, this equipment would remain in place and maintained until the completion of the project. This estimate also assumes annual interim mobilizations outside of Long Term Management Strategy (LTMS) work windows to safely store portable equipment (a hydraulic offloader, a large diesel generator barge, support barges, and a booster pump).

The offloader is assumed to accept material on an ad hoc basis (as material arrives by scow from various dredging projects) 24 hours a day, 7 days a week. For the periods when scows are not actively being unloaded, the offloader is on operational standby. Operational standby requires the offloader to be fully crewed and ready to receive dredge material, with the generators operating for local power only (pump engines are not operating). Outside of the unloading periods (at least 6 months of the year when dredging is not anticipated), an allowance was included for weekly inspections and maintenance on the installed infrastructure (mooring dolphins, pipelines, safety lights, etc.)

Once the placement sites are filled to the desired capacity, all infrastructure (mooring dolphins, pipeline, etc.) and portable equipment (offloader, barges, etc.) would be demobilized from the site. Another contract, not included in this estimate, would be released to perform the site restoration work (e.g. earthwork to shape upland transition zones and restoration features).

2.2 Scenarios Analyzed

Three different cost estimates were prepared based on different schedules (non-optimized vs. optimized vs. super optimized) and material sources (Federal only or Federal and non-Federal). The three cost estimates are described below:

- Non-optimized Estimate: Offloader received and pumped material from the Oakland and Redwood City Federal Maintenance Dredging Projects only. This non-optimized estimate assumed that the Federal dredging projects will be dredged and delivered to the offloader during typical LTMS environmental windows (June 1 through November 30). The available material was spread evenly over the six-month environmental window for each year in operation.

- Optimized Estimate: Offloader received and pumped material from the Oakland and Redwood City Federal Maintenance Dredging Projects and Non-Federal Dredging Projects (approximately 0.5 – 1.2 MCY annually of additional material from medium-

[1] A third-party contractor was assumed to perform the work in this analysis, however a number of entities (e.g. the State of California, Don Edwards National Wildlife Refuge, CSCC) could perform the work. The cost is not expected to change, as program management costs are not included.

sized dredgers such as Ports and private dredgers). The optimized estimate assumed that the Federal and Non-Federal dredging projects were dredged and delivered in as productive a time frame as possible (within the working windows). The available material was condensed into a three to four month annual timeframe.

- Super Optimized Estimate: Offloader received and pumped material from the Oakland, Redwood City, and Richmond (Inner & Outer Harbors) Federal Maintenance Dredging Projects and Non-Federal Dredging Projects (approximately 0.5 – 0.9 MCY[2] annually of additional material from medium-sized dredgers such as Ports and private dredgers). The super optimized estimate was similar to the optimized estimate in assuming the dredging projects were dredged and delivered in as productive a time frame as possible (within the working windows); however it includes the Richmond Inner and Outer Harbor Federal Maintenance Dredging Project. With the additional volume, the available material was still condensed into a three to five month annual timeframe.

Each estimate (non-optimized, optimized, and super optimized) was prepared for the four placement sites.

2.3 Sediment Sources

Attachments A through D contain sediment source analyses for the four placement sites. The analysis for each site includes sediment quantities, distance from the sediment source (dredging location) to the project, and a delivery schedule. Federal and Non-Federal medium sized-dredging projects in the San Francisco Bay Area were considered as potential sources, with dredging projects and volumes gathered from five years of LTMS dredging records, from 2008 to 2012.

The following considerations were used to determine sediment sources:

- Projects located in the central and north San Francisco Bay are too far from the South Bay to economically beneficially reuse material at the SBSP Restoration Project. These projects were not included as sediment sources in this analysis.

- The SBSP Restoration Project cannot compete economically with Alcatraz, as Alcatraz is closer in proximity to most dredging locations and does not have associated site preparation costs in the form of a tipping fee. Projects such as the Port of San Francisco that dispose partially at Alcatraz are uncertain sources for the SBSP Restoration Project. Some such projects were included in the optimized and super optimized estimates; however none were included in the non-optimized estimate.

- The two USACE hopper dredges operated on the West Coast, the Essayons and Yaquina, are not equipped to offload at an offloader. Projects[3] performed by these hopper dredges

[2] The volume from Non-Federal Dredging Projects for the super optimized estimate was less than for the optimized estimate because the super optimized estimate included the Richmond Federal Maintenance Dredging Project. The additional volume from Richmond kept the offloader running near its maximum production rate, leaving less time for smaller Non-Federal projects to deliver material.

[3] The volume dredged by these dredges is notable, however the majority is sand which is not optimal for raising pond bottom elevations. In fiscal year 2013, the USACE dredged with Yaquina the Suisun Bay

were assumed to dispose of material at open water sites and not at the SBSP Restoration Project in all estimates.

- Private dredging projects have considerations other than cost that limit their interest in beneficial reuse sites, such as liability concerns when disposing of material at a mixed-material placement site. Some such projects were included in the optimized and super optimized estimates; however none were included in the non-optimized estimate.

- Some projects, such as the Larkspur Ferry Channel Project, require shallow draft scows which have less capacity than typical scows. Transporting shallow draft scows to the South Bay from the North Bay is not economically attractive compared to transport to Alcatraz. In addition, the frequency of dredging of these smaller non-Federal projects is much less than the Federal Maintenance Projects. These projects were not included as sediment sources in this analysis.

The sediment source analysis assumes that all material delivered to the offloader from the dredging work will be suitable for wetland cover based on the results of each individual project's sediment sampling and analysis program, as required by DMMO. It is further assumed that all material delivered to the offloader is comprised of primarily mud and silt, as is typical, and preferable, of maintenance dredged material. (Silts and clays stay in suspension as the slurry spreads over the decant cell, as opposed to sand, which falls out of suspension quickly beneath the discharge pipe and must be pushed around.)

2.4 Sediment Delivery Schedule

Based on the sediment source quantities, a dredged material delivery schedule was generated for each placement site (and each estimate scenario). Attachments A through D contain the delivery schedules for each placement site following the sediment volume tables. The schedule assumes the sediment will be dredged and delivered to the offloader during typical LTMS dredging environmental windows (June 1 through November 30). Material volume delivery was spread evenly during the environmental window for the non-optimized schedules, and was condensed into a shorter timeframe for the optimized and super optimized schedule.

The durations of the four placement site contracts were determined from the placement capacity, offloading production and the defined annual offloading duration.

2.5 Placement Site Capacities

The capacities of the ponds that make up each of the four placement sites are listed in Table 1. Pond capacities are defined by the volume required to raise the existing pond bottom elevation to the surrounding marsh elevation (USACE 2012). Foundation consolidation and material shrinkage are not included in these capacity estimates. The volumes that would be needed for creation of an upland transition zone are also not included.

(152,213 CY). In fiscal year 2014, the USACE anticipates dredging with Essayons and Yaquina the San Francisco Bar Channel (724,000 CY), Richmond Connecting Channel and Maneuvering Area (792,000 CY), Pinole Shoals (232,000 CY), and Suisun Bay (170,000 CY).

Table 1. Placement Site Capacities

Eden Landing Ponds	Material Capacity for Raising Pond Bottom (CY)	Total Site Capacity (MCY)
E1	1,042,378	7.2
E1C	139,364	
E2	2,387,453	
E2C	78,896	
E4	477,816	
E4C	761,589	
E5	499,607	
E5C	316,684	
E6	542,874	
E6C	215,483	
E7	774,981	

Alviso Ponds	Material Capacity for Raising Pond Bottom (CY)	Total Site Capacity (MCY)
A1	3,039,463	8.2
A2W	5,187,504	
A5	6,612,534	17.0
A7	2,274,783	
A8	5,944,543*	
A8S	2,124,157*	
A9	2,793,144	22.5
A10	2,547,653	
A11	3,288,485	
A12	4,380,116	
A13	3,392,498	
A14	3,420,362	
A15	2,662,779	

Source: DMMIP (USACE 2012)

*Volumes not included in the DMMIP. Calculated using the difference between mean pond elevation and surround marsh as defined in the DMMIP (USACE 2012).

2.6 Offloader Locations

Two offloader locations were defined as shown in Figure 2.1: one for the Eden Landing Complex and one for the three placement sites in the Alviso Complex. Both offloaders were located in the deep water channel (approximately 18 feet deep). No additional dredging was considered.

The Alviso Offloader location was positioned south of Dumbarton Bridge but north of the railroad bridge in the South San Francisco Bay to minimize scow transport delays while navigating in relatively shallow waters near the railroad bridge.

2.7 Offloader Power

In this analysis, all equipment was assumed to be powered by a large diesel generator barge to avoid a large up-front capital cost for electrical infrastructure installation. Although electrical infrastructure requires a large up-front capital investment compared to the mobilization cost of a diesel generator barge, operational costs of electrical equipment are less than diesel fuel. For instance, the Hamilton Wetlands Restoration Project invested about $10 million to install electrical infrastructure to operate an offloader and booster pump. Monthly operating costs for the offloader and booster pump were estimated at about $0.5 million for electric power, whereas costs for the same equipment run by diesel fuel would have totaled to about $1 million a month (twice as much). Operating only about 3 months a year, it would take the project about 7 years to recover the upfront $10 million through operation savings with the electrical infrastructure.

For the SBSP Restoration Project, some project durations for the Alviso Ponds are long enough that the project could benefit from an electrical power supply; however the capital investment may vary depending on the location of the nearest available transmission line and equipment required. Typically, an onshore transformer station would have to be constructed to

pull power from an existing transmission line. An overhead pole line would be installed from the transformer station and continued to the Bay edge where another step down transformer would be installed. From the shore-side step down transformer, a submarine power cable would be laid on the Bay bottom out to the offloader and booster pump (if required). An electrical system such as this could increase costs for the SBSP Restoration Project by $9 to 12 million, depending on where the electrical source could be pulled from.

A diesel offloading system may be more economically attractive for a short project (5 years), however there may be CEQA limitations that could restrict diesel operations. Offloading operations and emissions are not covered under the maintenance dredging CEQA; they must either have a separate CEQA authorization or be part of the SBSP Restoration Project CEQA (as discussed in project-specific terms in M&N's Beneficial Reuse Feasibility Study). CEQA may limit NOx emissions to less than 100 tons/year and PM and/or PM10 may also be limited. This may or may not be a substantial limitation depending on whether or not the offloading operation emissions are constrained to the offloader, support vessels, and shore placement equipment. If the towing emissions are included for deepening projects, such as the Redwood City Deepening Project, it would be a significant limitation on yearly operations. Large generators can be fitted with selective catalytic reduction (SCR) systems to reduce emissions, however operation may still be restrained. As a result, most offloaders are equipped to be powered electrically.

Alternatively, there are carbon sequestration benefits that have not been accounted for with the project restoration effort. There could, or could not depending on the Bay Area emission calculation requirements, also be an overall reduction in emissions with the reduced transport distance to the South Bay as opposed to SF-DODs. LTMS's acknowledgement of this carbon sequestration and reduction in overall emissions would be beneficial to move this project through the permitting process.

2.8 Site Preparation to Receive Dredged Material

The placement sites would be prepared to receive dredged material by building containment berms and levees, weirs, and other decant water control structures. Levees would be improved if necessary to support heavy equipment, numerous truck trips, and dozers and loaders moving the slurry pipeline throughout the site. Low ground pressure equipment would excavate in-situ material in pond bottoms to build the containment berms within the placement sites. The larger ponds would require more containment berms to create long paths and to slow the slurry velocity down. Solids would settle out of suspension and the discharge back into the Bay would be low in turbidity. The cost to prepare each placement site will vary significantly with the size of the placement site, existing levee conditions, and the amount of existing levees within the placement site (i.e. many smaller ponds versus one large pond).

Site preparation costs were estimated at $2 to $3 per cubic yard for the SBSP Restoration Project based on recent beneficial reuse site construction costs. These costs were based off sites that required full infrastructure (there were no existing levees), so site investigations would reduce the cost if the existing levees are found to be in good condition and capable of containing decant water levels above MHW. The site preparation work does not include construction of flood protection levees or final restoration grading at the site (including building up transition zones).

2.9 Cost Estimate Assumptions

Costs were generated similar to the Moffatt & Nichol's Offloader Cost and Operational Analysis for USACE's Hamilton Wetland Restoration Project (M&N 2013). The following assumptions were made:

- **Direct Costs:** The cost estimates include direct costs, such as anticipated equipment, labor, and materials necessary to construct the project.
- **Project Overhead:** The cost estimates include the management, engineering, clerical, and support requirements for a general contractor to manage this type of a dredging/fill project. Additional costs were included to account for safety training and supplies, small tools and supplies, and unscheduled overtime.
- **Profit:** The cost estimates include a markup on the total cost to account for contractor profit. The markup cost is based on the contractor's direct labor costs to perform the work, which is typical of projects of this nature.
- **Bond:** The cost estimates include a 1.5% markup for contractor bonds.
- **Initial Capital Costs:** Initial capital costs include the following:
    - Initial one-time equipment mobilization of the offloader, booster pumps, and barges;
    - Pipeline installation;
    - Mooring dolphins purchase and installation; and
    - Other associated startup costs.
- **Operational Costs:** Operational costs include the following:
    - Annual interim mobilization and demobilization of equipment (offloader, booster pumps, barges);
    - Rental or lease costs for an offloader, booster pump(s), barges;
    - Labor and materials required to operate the offloader and booster pumps;
    - Pipeline operation;
    - Movement of the discharge pipe around the placement site;
    - Decant water quality testing such as the sample storage facility, testing laboratory, testing services, implementation of an SWPPP and effluent testing services; and
- **Offloader Productivity:** The offloading productivity was factored to account for delay between scow deliveries as well as for operating inefficiencies due to daily equipment maintenance, refueling, continued working hours, and crew shift changes.
- **Add-On Fees:** Of the total operational costs, a 3% design fee and 6% construction management fee were included in the estimate.
- **Contingency:** The offloader cost estimates include a contingency factor of 25%.
- **Escalation:** Costs have been escalated from 2015 to reflect the year in which construction is scheduled to take place based on the methodology detailed in the USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) Amendment #4 updated 31 March 2014.
- **Costs Not Included:** No costs were included for the following items:
    - Placement site restoration work including grading for restoration features;
    - Placement site material re-handling;

- Real estate transfer fees or other associated fees;
- Environmental documentation, permitting, mitigation and/or monitoring, or other program management costs; and
- Any electrical equipment; all is assumed to be diesel.

3. RESULTS

3.1 Offloading and Site Management Costs

The costs for offloading and managing the site during offloading, including all add-on fees, escalation, and contingency are summarized below in Table 2. The site preparation cost to receive dredged material is not included. The annual cost breakdowns for each placement site are included in Attachments E – H.

Table 2. Offloading and Site Management Costs

Placement Site	Non-Optimized	Optimized	Super Optimized
Eden Landing	$201.2M	$76.6M	$67.6M
Alviso (A1, A2W)	$255.2M	$90.8M	$76.6M
Alviso (A5, A7, A8, A8S)	$566.8M	$180.9M	$180.6M
Alviso (A9 - A15)	$792.8M	$240.0M	$226.2M

3.2 Offloading Project Durations

The offloading project durations (not including site preparation time) are listed in Table 3. The operating and standby times vary given the estimate scenario and are not shown. Of note, the volume of material delivered to the offloader is the limiting factor in the project duration, not the offloading production and placement rate.

Table 3. Offloading Project Durations

Placement Site	Non-Optimized	Optimized	Super Optimized
Eden Landing	8 yrs.	5 yrs.	4 yrs.
Alviso (A1, A2W)	10 yrs.	6 yrs.	4 yrs.
Alviso (A5, A7, A8, A8S)	19 yrs.	11 yrs.	9 yrs.
Alviso (A9 - A15)	25 yrs.	14 yrs.	11 yrs.

3.3 Tipping Fee

A tipping fee (price per cubic yard) is the cost dredgers would pay to dispose of material at the offloader. The revenue generated from the tipping fee would compensate the contractor's (or other entity's) work to install and operate the offloader and associated equipment (pipeline, barges, etc.), prepare the site to receive dredged material, and manage the site during the offloading operation.

For each estimate in this analysis, an average tipping fee was calculated using the costs summarized in Table 2, the cubic yard capacities listed in Table 1, and estimated site preparation costs. The tipping fees are summarized in Table 4. Site preparation costs were estimated at $2 to $3 per cubic yard.

Table 4. Tipping Fee at Offloader

Placement Site	Non-Optimized	Optimized	Super Optimized
Eden Landing	$30.62/CY	$13.23/CY	$12.32/CY
Alviso (A1, A2W)	$32.06/CY	$12.38/CY	$11.22/CY
Alviso (A5, A7, A8, A8S)	$34.87/CY	$12.63/CY	$12.52/CY
Alviso (A9 - A15)	$37.10/CY	$12.66/CY	$12.14/CY

3.4 Cost Comparison to Existing Disposal Reuse/Sites

Disposal costs for the four largest sediment source projects, all Federal maintenance projects, were compared to beneficial reuse costs at the SBSP Restoration Project. The Federal standard was used as the disposal site for the Federal maintenance projects. Table 5 summarizes the results. Costs include dredging, transport and disposal tipping fees. The SBSP Restoration Project costs assume material is delivered in an optimized schedule, and costs are averaged over the project duration.

Table 5. SBSP Restoration Project and Federal Standard Comparison

Placement Site	Eden Landing Offloader	Alviso Offloader	Federal Standard		SF-DODS (from DMMIP)
Oakland Inner & Outer Harbor[1]	$24.62/CY	$24.40/CY	$21.00 - 28.00/CY[3] (SF-DODS)		$25.33/CY
Redwood City Harbor[2]	$21.54/CY	$21.32/CY	$16.50/CY (SF-11)	$28.00/CY[4] (SF-DODS)	$33.17/CY
Richmond Inner Harbor	$24.94/CY	$25.18/CY	$22.00/CY (SF-DODS)		$26.02/CY
Richmond Outer Harbor	$25.07/CY	$25.27/CY	$22.00/CY (SF-DODS)		$26.02/CY

[1] As a reference, Oakland Federal Channel to Montezuma/SF-DODS in 2013 was $30.77/CY for approx. 330,600 CY.
[2] Redwood City Harbor Federal Standard is SF-11.
[3] $28.00 was the unit cost from the 2014 bid.
[4] Unit cost from 2010 Berth dredging with disposal at SF-DODS.

Beneficial reuse sites at Eden Landing and Alviso are cost competitive with the Federal Standard costs of USACE's four largest maintenance dredging projects.

4. SUMMARY AND NEXT STEPS

4.1 Summary

The San Francisco Bay Area currently has only one cost-effective, long term beneficial reuse site, the Montezuma Wetlands Project. Given the location and capacity of Montezuma, a South Bay beneficial reuse site is essential to further the LTMS commitment of reducing in-bay disposal, as well as increasing beneficial reuse in the sediment-deprived Bay system. The SBSP Restoration Project represents the type of stable, long-term project that could attract enough dredged material to keep the tipping fee cost competitive with offshore disposal. With very few deepening projects foreseen in the Bay Area, only the collective volume of numerous dredging projects can make a beneficial reuse site possible in the near future.

This cost estimate shows that beneficial reuse at the SBSP Restoration Project is generally cost competitive with the Federal Standard costs of USACE's South Bay maintenance dredging projects. The sediment volumes and sources assumed in this cost estimate are realistic, assuming coordination with USACE continues to move forward and an agreement is made in the future (see Section 4.2). This project requires DMMO support, which will in turn convince the Bay Area dredging community that the SBSP Restoration Project will be a viable beneficial reuse option in the future.

This cost estimate assumes that the current Bay Area dredging equipment, which has been built for offshore disposal, will remain. If however, the Eden Landing or Alviso Offloader is established and proves competitive, private dredgers will begin to shift their equipment from ocean disposal dump scows to less costly hopper scows more suited for offloading. Compared to dump scows, hopper scows are less costly and more efficient from an offloading standpoint. Given the option, dredgers prefer hopper scows to dump scows because hopper scows have minimal moving parts, requiring less maintenance and less time lost to mechanical failures.

If the dredgers change their equipment to fit a new beneficial reuse practice in the Bay Area, as they did when SF-DODS first became the primary disposal location, the costs to beneficially reuse material should decrease and prove to be very competitive.

Looking forward, if the SBSP Restoration Project were to install electrical infrastructure for an offloader at Alviso, the Bay Area dredging community would acknowledge the significant financial investment and undoubtedly include the beneficial reuse site in their future plans.

4.2 Future Roles and Responsibilities

Beneficial reuse in the SBSP Restoration Project depends on the cooperation of numerous parties. The following is a list of potential roles and responsibilities of the regulatory agencies, dredger, third party offloader contractor, and the CSCC.

- Dredgers: The largest sediment volume will be from the USACE. A Memorandum of Understanding (MOU) between USACE and the CSCC would provide future planning stability to both the SBSP Restoration Project as a placement site and USACE as a material source. Other smaller Ports and private dredgers could also join the MOU, or at a minimum benefit from one between USACE and CSCC.
- LTMS/DMMO: Without agency encouragement to beneficially reuse material in the Bay Area, some projects will continue to go to SF-DODS given the available equipment and lower uncertainties associated with a proven disposal site. Material disposed at SF-DODS will reduce the material economies of scale benefit from the SBSP Restoration Project. Incentivized agency backing to send material to the SBSP Restoration Project

in exchange for portions of material to be disposed of in-bay (inexpensively) could kick-start, and maintain, beneficial reuse.

- CSCC: As the project owner, the CSCC would act as the overall program manager and coordinate the MOUs and encourage agency participation. The CSCC could actively manage the placement sites and be responsible for construction management oversight throughout the offloading and decanting operations. The placement site design and final restoration grading would be the responsibility of CSCC.

Summary of Costs for Dredging, Transport and Placement at Eden Landing Ponds:

1. $21.54 to $25.07 per CY averaged over 5 years (about $10 for dredging and transport to site, about $11 for offloading, and about $2 for sire preparation)
2. For Oakland Harbor material, the costs are comparable to disposal at DODS;
3. For Redwood City material, costs are less than DODS

Assumptions for above estimates:

1. Dredging is Optimized, which means following projects all dispose at Eden Landing:
   Federal: Oakland & Redwood City
   Non-Federal: Above Port Berths, POSF, Chevron, Larkspur, Conoco, Alameda Pt, BAE
2. Optimized dredging means ALL above projects bring material to Eden Landing over 3-4 months
3. The full disposal capacity of 7.2 million CY is utilized (not partially filled)
4. Site restoration costs not included (regrading, moving material around, breaching etc.)

5. REFERENCES

1. Moffatt & Nichol Hamilton Wetlands Restoration Project Commercially Owned Hydraulic Offloader Cost and Operational Analysis Final Submittal. Prepared for USACE. May 2013.
2. USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS), Amendment #2 updated 31 March 2013.
3. USACE South San Francisco Bay Dredged Material Management Implementation Plan (DMMIP), South Bay Salt Ponds Restoration Project: Conceptual Beneficial Use Analysis, 29 February 2012.

ATTACHMENT A

SEDIMENT SOURCE ANALYSIS
EDEN LANDING (E1, E2, E4 – E7, E1C, E2C, E4C – E6C)

SBSP RESTORATION PROJECT - BENEFICIAL REUSE STUDY
PREDICTED DREDGED MATERIAL DELIVERY SCHEDULE

CONSIDERED PROJECTS	Frequency (Years)	Annual Volume	Volume per Episode2	Historical & Current Disposal Site(s)	Windows	Consulation Required	Distance to Eden Landing Offloader (miles one way)	Distance to Alviso Offloader (miles one way)
Federal								
Oakland Inner & Outer Harbor	1	734,000	734,000	SF-11, Montezuma, SF-DODS, ~~Hamilton~~	Aug. 1 - Nov. 30	4	23.7	29.2
Redwood City Harbor	3	157,000	471,000	SF-11, ~~Bair Island, Hamilton~~	Jun. 1 - Nov. 30	6	3.4	8.9
Richmond Inner Harbor	1	253,000	253,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	35.3	40.8
Richmond Outer Harbor	1	180,000	180,000	SF-11, SF-10	Jun. 1 - Nov. 30	6	35.3	40.8
Suisun Bay[2]	1	159,000	159,000	SF-16, SF-9	Aug. 1 - Nov. 30	4	62.8	68.4
Pinole Shoal[2]	1	163,000	163,000	SF-10, SF-8, ~~Hamilton~~	Jun. 1 - Nov. 30	6	40.7	46.2
	Subtotal	1,646,000						
Mid-Sized Non-Federal								
Chevron	1	135,000	135,000	SF-11, ~~Hamilton~~, SF-DODS, SF-10, Montezuma	Jun. 1 - Nov. 30	6	32.2	37.8
Larkspur Ferry Channel	4	62,000	248,000	SF-11, SF-10, SF-DODS	Jun. 1 - Nov. 30	6	35.1	40.6
Port of Oakland (Berths)	1	93,000	93,000	SF-11, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	25.4	30.9
Port of Redwood City	4	10,000	40,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	3.4	8.9
Port of San Francisco	1	173,000	173,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	23.4	28.9
Port of Richmond (Berths)	3	16,667	50,001	SF-DODS	Jun. 1 - Nov. 30	6	35.3	40.8
Valero[3]	4 X per yr	55,000	55,000	SF-9, SF-11, SF-DODS, Winter Island, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	55.6	61.1
ConocoPhillips (Rodeo)	2	13,000	26,000	SF-9, SF-8	Jun. 1 - Nov. 30	6	47.4	52.9
Alameda Point Channel	3	91,000	273,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	21.8	27.3
BAE Systems	2	63,000	126,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	19.6	25.1
Allied Defense Recycling	4	61,000	244,000	SF-9, SF-DODS	Aug. 1 - Oct. 15	2.5	51.2	56.7
Emeryville Marina	4	14,000	56,000	SF-11	Aug. 1 - Nov. 30	4	28.0	33.5
	Subtotal	786,667						
	Total	2,432,667						

Please check the following projects:

[1]Volumes determined from five years of LTMS records (2008 - 2012).

[2]Suisun Bay and Pinole Shoal Projects are performed by Essayons (USACE dredge), which cannot economically dispose of material at an offloader. Projects are not included as sources.

[3]Valero Project is dredged frequently outside the assumed work windows. Project is not included as a source.

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (NON-OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Non-Optimized

TOTALS	7,285,000	MCY
	8	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2015

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2016

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2017

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2018

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2019

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2020

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (NON-OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Non-Optimized

TOTALS	7,285,000	MCY
	8	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2021

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2022

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Optimized

TOTALS	7,481,002	MCY
	5	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	419,000	419,000	419,000	0	**1,257,000**
					CY/day	*0*	*0*	*0*	*13,774*	*13,774*	*13,774*		

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Optimized

TOTALS	7,481,002	MCY
	5	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	511,333	511,333	511,333	0	**1,534,000**
					CY/day	*0*	*0*	*0*	*16,809*	*16,809*	*16,809*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	580,100	580,100	531,300	482,500	0	**2,174,001**
					CY/day	*0*	*0*	*19,070*	*19,070*	*17,465*	*15,861*		

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Optimized

TOTALS	7,481,002	MCY
	5	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2019

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron													0
Larkspur Ferry Channel													0
Port of Oakland (Berths)													0
Port of Redwood City													0
Port of San Francisco													0
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	244,667	244,667	244,667	0	**734,000**
					CY/day	*0*	*0*	*0*	*8,043*	*8,043*	*8,043*		

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (SUPER OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Super Optimized

TOTALS	7,257,001	MCY
	4	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	553,750	553,750	553,750	553,750	0	**2,215,001**
					CY/day	*0*	*0*	*18,203*	*18,203*	*18,203*	*18,203*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	563,333	563,333	563,333	0	**1,690,000**
					CY/day	*0*	*0*	*0*	*18,519*	*18,519*	*18,519*		

PREDICTED MATERIAL DELIVERY SCHEDULE
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY) (SUPER OPTIMIZED)

Eden Landing (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)
Super Optimized

TOTALS	7,257,001	MCY
	4	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	491,750	491,750	491,750	491,750	0	**1,967,000**
					CY/day	*0*	*0*	*16,165*	*16,165*	*16,165*	*16,165*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron													0
Larkspur Ferry Channel													0
Port of Oakland (Berths)													0
Port of Redwood City													0
Port of San Francisco													0
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	461,667	461,667	461,667	0	**1,385,000**
					CY/day	*0*	*0*	*0*	*15,176*	*15,176*	*15,176*		

ATTACHMENT B

SEDIMENT SOURCE ANALYSIS
ALVISO (A1, A2W)

SBSP RESTORATION PROJECT - BENEFICIAL REUSE STUDY
PREDICTED DREDGED MATERIAL DELIVERY SCHEDULE

CONSIDERED PROJECTS	Frequency (Years)	Annual Volume	Volume per Episode2	Historical & Current Disposal Site(s)	Windows	Consulation Required	Distance to Eden Landing Offloader (miles one way)	Distance to Alviso Offloader (miles one way)
Federal								
Oakland Inner & Outer Harbor	1	734,000	734,000	SF-11, Montezuma, SF-DODS, ~~Hamilton~~	Aug. 1 - Nov. 30	4	23.7	29.2
Redwood City Harbor	3	157,000	471,000	SF-11, ~~Bair Island, Hamilton~~	Jun. 1 - Nov. 30	6	3.4	8.9
Richmond Inner Harbor	1	253,000	253,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	35.3	40.8
Richmond Outer Harbor	1	180,000	180,000	SF-11, SF-10	Jun. 1 - Nov. 30	6	35.3	40.8
Suisun Bay[2]	1	159,000	159,000	SF-16, SF-9	Aug. 1 - Nov. 30	4	62.8	68.4
Pinole Shoal[2]	1	163,000	163,000	SF-10, SF-8, ~~Hamilton~~	Jun. 1 - Nov. 30	6	40.7	46.2
	Subtotal	1,646,000						
Mid-Sized Non-Federal								
Chevron	1	135,000	135,000	SF-11, ~~Hamilton~~, SF-DODS, SF-10, Montezuma	Jun. 1 - Nov. 30	6	32.2	37.8
Larkspur Ferry Channel	4	62,000	248,000	SF-11, SF-10, SF-DODS	Jun. 1 - Nov. 30	6	35.1	40.6
Port of Oakland (Berths)	1	93,000	93,000	SF-11, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	25.4	30.9
Port of Redwood City	4	10,000	40,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	3.4	8.9
Port of San Francisco	1	173,000	173,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	23.4	28.9
Port of Richmond (Berths)	3	16,667	50,001	SF-DODS	Jun. 1 - Nov. 30	6	35.3	40.8
Valero[3]	4 X per yr	55,000	55,000	SF-9, SF-11, SF-DODS, Winter Island, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	55.6	61.1
ConocoPhillips (Rodeo)	2	13,000	26,000	SF-9, SF-8	Jun. 1 - Nov. 30	6	47.4	52.9
Alameda Point Channel	3	91,000	273,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	21.8	27.3
BAE Systems	2	63,000	126,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	19.6	25.1
Allied Defense Recycling	4	61,000	244,000	SF-9, SF-DODS	Aug. 1 - Oct. 15	2.5	51.2	56.7
Emeryville Marina	4	14,000	56,000	SF-11	Aug. 1 - Nov. 30	4	28.0	33.5
	Subtotal	786,667						
	Total	2,432,667						

Please check the following projects:

[1]Volumes determined from five years of LTMS records (2008 - 2012).

[2]Suisun Bay and Pinole Shoal Projects are performed by Essayons (USACE dredge), which cannot economically dispose of material at an offloader. Projects are not included as sources.

[3]Valero Project is dredged frequently outside the assumed work windows. Project is not included as a source.

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (NON-OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Non-optimized

TOTALS	8,490,000	MCY
	10	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2015

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2016

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2017

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2018

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2019

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2020

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (NON-OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Non-optimized

TOTALS	8,490,000	MCY
	10	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2021

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2022

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2023

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2024

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								0	0	0	0		
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	78,500	78,500	78,500	78,500	0	**471,000**
					CY/day	*2,581*	*2,581*	*2,581*	*2,581*	*2,581*	*2,581*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Optimized

TOTALS	8,742,002	MCY
	6	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	419,000	419,000	419,000	0	**1,257,000**
					CY/day	*0*	*0*	*0*	*13,774*	*13,774*	*13,774*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Optimized

TOTALS	8,742,002	MCY
	6	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	511,333	511,333	511,333	0	**1,534,000**
					CY/day	*0*	*0*	*0*	*16,809*	*16,809*	*16,809*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	580,100	580,100	531,300	482,500	0	**2,174,001**
					CY/day	*0*	*0*	*19,070*	*19,070*	*17,465*	*15,861*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Optimized

TOTALS	8,742,002	MCY
	6	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2019

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	420,333	420,333	420,333	0	**1,261,000**
					CY/day	*0*	*0*	*0*	*13,818*	*13,818*	*13,818*		

2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron													0
Larkspur Ferry Channel													0
Port of Oakland (Berths)													0
Port of Redwood City													0
Port of San Francisco													0
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	244,667	244,667	244,667	0	**734,000**
					CY/day	*0*	*0*	*0*	*8,043*	*8,043*	*8,043*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (SUPER OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Super Optimized

TOTALS	8,310,001	MCY
	4	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	553,750	553,750	553,750	553,750	0	**2,215,001**
					CY/day	*0*	*0*	*18,203*	*18,203*	*18,203*	*18,203*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	563,333	563,333	563,333	0	**1,690,000**
					CY/day	*0*	*0*	*0*	*18,519*	*18,519*	*18,519*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A1, A2W, 8.3 MCY) (SUPER OPTIMIZED)

Alviso (A1, A2W, 8.3 MCY) Super Optimized

TOTALS	8,310,001	MCY
	4	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	491,750	491,750	491,750	491,750	0	**1,967,000**
					CY/day	*0*	*0*	*16,165*	*16,165*	*16,165*	*16,165*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor							94,200	94,200	94,200	94,200	94,200		471,000
Richmond Inner Harbor							50,600	50,600	50,600	50,600	50,600		253,000
Richmond Outer Harbor							36,000	36,000	36,000	36,000	36,000		180,000
Chevron							27,000	27,000	27,000	27,000	27,000		135,000
Larkspur Ferry Channel							49,600	49,600	49,600	49,600	49,600		248,000
Port of Oakland (Berths)													0
Port of Redwood City													0
Port of San Francisco							34,600	34,600	34,600	34,600	34,600		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	292,000	573,100	573,100	524,300	475,500	0	**2,438,000**
					CY/day	*0*	*9,599*	*18,840*	*18,840*	*17,235*	*15,631*		

ATTACHMENT C

SEDIMENT SOURCE ANALYSIS
ALVISO (A5, A7, A8, A8S)

SBSP RESTORATION PROJECT - BENEFICIAL REUSE STUDY
PREDICTED DREDGED MATERIAL DELIVERY SCHEDULE

CONSIDERED PROJECTS	Frequency (Years)	Annual Volume	Volume per Episode2	Historical & Current Disposal Site(s)	Windows	Consulation Required	Distance to Eden Landing Offloader (miles one way)	Distance to Alviso Offloader (miles one way)
Federal								
Oakland Inner & Outer Harbor	1	734,000	734,000	SF-11, Montezuma, SF-DODS, ~~Hamilton~~	Aug. 1 - Nov. 30	4	23.7	29.2
Redwood City Harbor	3	157,000	471,000	SF-11, ~~Bair Island, Hamilton~~	Jun. 1 - Nov. 30	6	3.4	8.9
Richmond Inner Harbor	1	253,000	253,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	35.3	40.8
Richmond Outer Harbor	1	180,000	180,000	SF-11, SF-10	Jun. 1 - Nov. 30	6	35.3	40.8
Suisun Bay[2]	1	159,000	159,000	SF-16, SF-9	Aug. 1 - Nov. 30	4	62.8	68.4
Pinole Shoal[2]	1	163,000	163,000	SF-10, SF-8, ~~Hamilton~~	Jun. 1 - Nov. 30	6	40.7	46.2
	Subtotal	1,646,000						
Mid-Sized Non-Federal								
Chevron	1	135,000	135,000	SF-11, ~~Hamilton~~, SF-DODS, SF-10, Montezuma	Jun. 1 - Nov. 30	6	32.2	37.8
Larkspur Ferry Channel	4	62,000	248,000	SF-11, SF-10, SF-DODS	Jun. 1 - Nov. 30	6	35.1	40.6
Port of Oakland (Berths)	1	93,000	93,000	SF-11, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	25.4	30.9
Port of Redwood City	4	10,000	40,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	3.4	8.9
Port of San Francisco	1	173,000	173,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	23.4	28.9
Port of Richmond (Berths)	3	16,667	50,001	SF-DODS	Jun. 1 - Nov. 30	6	35.3	40.8
Valero[3]	4 X per yr	55,000	55,000	SF-9, SF-11, SF-DODS, Winter Island, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	55.6	61.1
ConocoPhillips (Rodeo)	2	13,000	26,000	SF-9, SF-8	Jun. 1 - Nov. 30	6	47.4	52.9
Alameda Point Channel	3	91,000	273,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	21.8	27.3
BAE Systems	2	63,000	126,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	19.6	25.1
Allied Defense Recycling	4	61,000	244,000	SF-9, SF-DODS	Aug. 1 - Oct. 15	2.5	51.2	56.7
Emeryville Marina	4	14,000	56,000	SF-11	Aug. 1 - Nov. 30	4	28.0	33.5
	Subtotal	786,667						
	Total	2,432,667						

Please check the following projects:

[1]Volumes determined from five years of LTMS records (2008 - 2012).

[2]Suisun Bay and Pinole Shoal Projects are performed by Essayons (USACE dredge), which cannot economically dispose of material at an offloader. Projects are not included as sources.

[3]Valero Project is dredged frequently outside the assumed work windows. Project is not included as a source.

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (NON-OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Non-optimized

TOTALS	17,243,000	MCY
	19	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2015

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2016

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2017

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2018

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2019

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2020

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (NON-OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Non-optimized

TOTALS	17,243,000	MCY
	19	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2021

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2022

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2023

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2024

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2025

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2026

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (NON-OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Non-optimized

TOTALS	17,243,000	MCY
	19	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2027

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2028

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2029

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2030

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2031

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2032

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (NON-OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Non-optimized

TOTALS	17,243,000	MCY
	19	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2033

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Optimized

TOTALS	17,019,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	419,000	419,000	419,000	0	**1,257,000**
					CY/day	*0*	*0*	*0*	*13,774*	*13,774*	*13,774*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Optimized

TOTALS	17,019,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	511,333	511,333	511,333	0	**1,534,000**
					CY/day	*0*	*0*	*0*	*16,809*	*16,809*	*16,809*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	580,100	580,100	531,300	482,500	0	**2,174,001**
					CY/day	*0*	*0*	*19,070*	*19,070*	*17,465*	*15,861*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Optimized

TOTALS	17,019,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2019

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	420,333	420,333	420,333	0	**1,261,000**
					CY/day	*0*	*0*	*0*	*13,818*	*13,818*	*13,818*		

2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	510,000	510,000	510,000	0	**1,530,000**
					CY/day	*0*	*0*	*0*	*16,765*	*16,765*	*16,765*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Optimized

TOTALS	17,019,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2021

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2022

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								244,667	244,667	244,667			734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								45,000	45,000	45,000			135,000
Larkspur Ferry Channel								82,667	82,667	82,667			248,000
Port of Oakland (Berths)								31,000	31,000	31,000			93,000
Port of Redwood City													0
Port of San Francisco								57,667	57,667	57,667			173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								8,667	8,667	8,667			26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	567,267	567,267	518,467	0	0	**1,653,000**
					CY/day	*0*	*0*	*18,648*	*18,648*	*17,044*	*0*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Optimized

TOTALS	17,019,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2023

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	511,333	511,333	511,333	0	**1,534,000**
					CY/day	*0*	*0*	*0*	*16,809*	*16,809*	*16,809*		

2024

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	592,667	592,667	592,667	0	**1,778,001**
					CY/day	*0*	*0*	*0*	*19,483*	*19,483*	*19,483*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Optimized

TOTALS	17,019,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2025

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron													0
Larkspur Ferry Channel													0
Port of Oakland (Berths)													0
Port of Redwood City													0
Port of San Francisco													0
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	244,667	244,667	244,667	0	**734,000**
					CY/day	*0*	*0*	*0*	*8,043*	*8,043*	*8,043*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (SUPER OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Super Optimized

TOTALS	17,171,003	MCY
	9	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	553,750	553,750	553,750	553,750	0	**2,215,001**
					CY/day	*0*	*0*	*18,203*	*18,203*	*18,203*	*18,203*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	563,333	563,333	563,333	0	**1,690,000**
					CY/day	*0*	*0*	*0*	*18,519*	*18,519*	*18,519*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (SUPER OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Super Optimized

TOTALS	17,171,003	MCY
	9	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	491,750	491,750	491,750	491,750	0	**1,967,000**
					CY/day	*0*	*0*	*16,165*	*16,165*	*16,165*	*16,165*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor							94,200	94,200	94,200	94,200	94,200		471,000
Richmond Inner Harbor							50,600	50,600	50,600	50,600	50,600		253,000
Richmond Outer Harbor							36,000	36,000	36,000	36,000	36,000		180,000
Chevron							27,000	27,000	27,000	27,000	27,000		135,000
Larkspur Ferry Channel							49,600	49,600	49,600	49,600	49,600		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco							34,600	34,600	34,600	34,600	34,600		173,000
Port of Richmond (Berths)							10,000	10,000	10,000	10,000	10,000		50,001
ConocoPhillips (Rodeo)							5,200	5,200	5,200	5,200	5,200		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	307,200	611,550	611,550	562,750	513,950	0	**2,607,001**
					CY/day	*0*	*10,099*	*20,104*	*20,104*	*18,499*	*16,895*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (SUPER OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Super Optimized

TOTALS	17,171,003	MCY
	9	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2019

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	564,667	564,667	564,667	0	**1,694,000**
					CY/day	*0*	*0*	*0*	*18,562*	*18,562*	*18,562*		

2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City								10,000	10,000	10,000	10,000		40,000
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina								14,000	14,000	14,000	14,000		56,000
TOTAL	0	0	0	0	0	0	0	490,750	490,750	490,750	490,750	0	**1,963,000**
					CY/day	*0*	*0*	*16,132*	*16,132*	*16,132*	*16,132*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (SUPER OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Super Optimized

TOTALS	17,171,003	MCY
	9	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2021

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	553,750	553,750	553,750	553,750	0	**2,215,001**
					CY/day	*0*	*0*	*18,203*	*18,203*	*18,203*	*18,203*		

2022

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	558,100	558,100	509,300	460,500	0	**2,086,000**
					CY/day	*0*	*0*	*18,346*	*18,346*	*16,742*	*15,138*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A5, A7, A8, A8S, 17.0 MCY) (SUPER OPTIMIZED)

Alviso (A5, A7, A8, A8S, 17.0 MCY) Super Optimized

TOTALS	17,171,003	MCY
	9	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2023

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron													0
Larkspur Ferry Channel													0
Port of Oakland (Berths)													0
Port of Redwood City													0
Port of San Francisco													0
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	244,667	244,667	244,667	0	**734,000**
					CY/day	*0*	*0*	*0*	*8,043*	*8,043*	*8,043*		

ATTACHMENT D

SEDIMENT SOURCE ANALYSIS
ALVISO (A9 – A15)

SBSP RESTORATION PROJECT - BENEFICIAL REUSE STUDY
PREDICTED DREDGED MATERIAL DELIVERY SCHEDULE

CONSIDERED PROJECTS	Frequency (Years)	Annual Volume	Volume per Episode2	Historical & Current Disposal Site(s)	Windows	Consulation Required	Distance to Eden Landing Offloader (miles one way)	Distance to Alviso Offloader (miles one way)
Federal								
Oakland Inner & Outer Harbor	1	734,000	734,000	SF-11, Montezuma, SF-DODS, ~~Hamilton~~	Aug. 1 - Nov. 30	4	23.7	29.2
Redwood City Harbor	3	157,000	471,000	SF-11, ~~Bair Island, Hamilton~~	Jun. 1 - Nov. 30	6	3.4	8.9
Richmond Inner Harbor	1	253,000	253,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	35.3	40.8
Richmond Outer Harbor	1	180,000	180,000	SF-11, SF-10	Jun. 1 - Nov. 30	6	35.3	40.8
Suisun Bay[2]	1	159,000	159,000	SF-16, SF-9	Aug. 1 - Nov. 30	4	62.8	68.4
Pinole Shoal[2]	1	163,000	163,000	SF-10, SF-8, ~~Hamilton~~	Jun. 1 - Nov. 30	6	40.7	46.2
	Subtotal	1,646,000						
Mid-Sized Non-Federal								
Chevron	1	135,000	135,000	SF-11, ~~Hamilton~~, SF-DODS, SF-10, Montezuma	Jun. 1 - Nov. 30	6	32.2	37.8
Larkspur Ferry Channel	4	62,000	248,000	SF-11, SF-10, SF-DODS	Jun. 1 - Nov. 30	6	35.1	40.6
Port of Oakland (Berths)	1	93,000	93,000	SF-11, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	25.4	30.9
Port of Redwood City	4	10,000	40,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	3.4	8.9
Port of San Francisco	1	173,000	173,000	SF-11, SF-DODS, ~~Hamilton~~	Jun. 1 - Nov. 30	6	23.4	28.9
Port of Richmond (Berths)	3	16,667	50,001	SF-DODS	Jun. 1 - Nov. 30	6	35.3	40.8
Valero[3]	4 X per yr	55,000	55,000	SF-9, SF-11, SF-DODS, Winter Island, Montezuma, ~~Hamilton~~	Aug. 1 - Nov. 30	4	55.6	61.1
ConocoPhillips (Rodeo)	2	13,000	26,000	SF-9, SF-8	Jun. 1 - Nov. 30	6	47.4	52.9
Alameda Point Channel	3	91,000	273,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	21.8	27.3
BAE Systems	2	63,000	126,000	SF-11, SF-DODS	Jun. 1 - Nov. 30	6	19.6	25.1
Allied Defense Recycling	4	61,000	244,000	SF-9, SF-DODS	Aug. 1 - Oct. 15	2.5	51.2	56.7
Emeryville Marina	4	14,000	56,000	SF-11	Aug. 1 - Nov. 30	4	28.0	33.5
	Subtotal	786,667						
	Total	2,432,667						

Please check the following projects:

[1]Volumes determined from five years of LTMS records (2008 - 2012).

[2]Suisun Bay and Pinole Shoal Projects are performed by Essayons (USACE dredge), which cannot economically dispose of material at an offloader. Projects are not included as sources.

[3]Valero Project is dredged frequently outside the assumed work windows. Project is not included as a source.

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (NON-OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Non-optimized

TOTALS	22,589,000	MCY
	25	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2015

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2016

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2017

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2018

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2019

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2020

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (NON-OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Non-optimized

TOTALS	22,589,000	MCY
	25	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2021

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2022

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2023

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2024

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2025

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2026

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (NON-OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Non-optimized

TOTALS	22,589,000	MCY
	25	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2027

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2028

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2029

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2030

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2031

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2032

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (NON-OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Non-optimized

TOTALS	22,589,000	MCY
	25	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2033

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2034

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2035

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2036

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

2037

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

2038

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						0	0	0	0	0	0		
FEDERAL TOTAL	0	0	0	0	0	0	0	183,500	183,500	183,500	183,500	0	**734,000**
					CY/day	*0*	*0*	*6,032*	*6,032*	*6,032*	*6,032*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (NON-OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Non-optimized

TOTALS	22,589,000	MCY
	25	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.

2039

FEDERAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor						78,500	78,500	78,500	78,500	78,500	78,500		471,000
FEDERAL TOTAL	0	0	0	0	0	78,500	78,500	262,000	262,000	262,000	262,000	0	**1,205,000**
					CY/day	*2,581*	*2,581*	*8,613*	*8,613*	*8,613*	*8,613*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	419,000	419,000	419,000	0	**1,257,000**
					CY/day	*0*	*0*	*0*	*13,774*	*13,774*	*13,774*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	511,333	511,333	511,333	0	**1,534,000**
					CY/day	*0*	*0*	*0*	*16,809*	*16,809*	*16,809*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	580,100	580,100	531,300	482,500	0	**2,174,001**
					CY/day	*0*	*0*	*19,070*	*19,070*	*17,465*	*15,861*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2019

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	420,333	420,333	420,333	0	**1,261,000**
					CY/day	*0*	*0*	*0*	*13,818*	*13,818*	*13,818*		

2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	510,000	510,000	510,000	0	**1,530,000**
					CY/day	*0*	*0*	*0*	*16,765*	*16,765*	*16,765*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2021

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2022

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								244,667	244,667	244,667			734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								45,000	45,000	45,000			135,000
Larkspur Ferry Channel								82,667	82,667	82,667			248,000
Port of Oakland (Berths)								31,000	31,000	31,000			93,000
Port of Redwood City													0
Port of San Francisco								57,667	57,667	57,667			173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								8,667	8,667	8,667			26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	567,267	567,267	518,467	0	0	**1,653,000**
					CY/day	*0*	*0*	*18,648*	*18,648*	*17,044*	*0*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2023

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel									91,000	91,000	91,000		273,000
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	511,333	511,333	511,333	0	**1,534,000**
					CY/day	*0*	*0*	*0*	*16,809*	*16,809*	*16,809*		

2024

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	592,667	592,667	592,667	0	**1,778,001**
					CY/day	*0*	*0*	*0*	*19,483*	*19,483*	*19,483*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2025

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	420,333	420,333	420,333	0	**1,261,000**
					CY/day	*0*	*0*	*0*	*13,818*	*13,818*	*13,818*		

2026

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	518,100	518,100	469,300	420,500	0	**1,926,000**
					CY/day	*0*	*0*	*17,032*	*17,032*	*15,427*	*13,823*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Optimized

TOTALS	22,511,005	MCY
	14	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2027

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor									157,000	157,000	157,000		471,000
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)									16,667	16,667	16,667		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	594,000	594,000	594,000	0	**1,782,001**
					CY/day	*0*	*0*	*0*	*19,527*	*19,527*	*19,527*		

2028

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor													0
Richmond Outer Harbor													0
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	419,000	419,000	419,000	0	**1,257,000**
					CY/day	*0*	*0*	*0*	*13,774*	*13,774*	*13,774*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (SUPER OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Super Optimized

TOTALS	22,309,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	553,750	553,750	553,750	553,750	0	**2,215,001**
					CY/day	*0*	*0*	*18,203*	*18,203*	*18,203*	*18,203*		

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City									13,333	13,333	13,333		40,000
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)									8,667	8,667	8,667		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina									18,667	18,667	18,667		56,000
TOTAL	0	0	0	0	0	0	0	0	563,333	563,333	563,333	0	**1,690,000**
					CY/day	*0*	*0*	*0*	*18,519*	*18,519*	*18,519*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (SUPER OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Super Optimized

TOTALS	22,309,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	491,750	491,750	491,750	491,750	0	**1,967,000**
					CY/day	*0*	*0*	*16,165*	*16,165*	*16,165*	*16,165*		

2018

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor							94,200	94,200	94,200	94,200	94,200		471,000
Richmond Inner Harbor							50,600	50,600	50,600	50,600	50,600		253,000
Richmond Outer Harbor							36,000	36,000	36,000	36,000	36,000		180,000
Chevron							27,000	27,000	27,000	27,000	27,000		135,000
Larkspur Ferry Channel							49,600	49,600	49,600	49,600	49,600		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco							34,600	34,600	34,600	34,600	34,600		173,000
Port of Richmond (Berths)							10,000	10,000	10,000	10,000	10,000		50,001
ConocoPhillips (Rodeo)							5,200	5,200	5,200	5,200	5,200		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	307,200	611,550	611,550	562,750	513,950	0	**2,607,001**
					CY/day	*0*	*10,099*	*20,104*	*20,104*	*18,499*	*16,895*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (SUPER OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Super Optimized

TOTALS	22,309,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2019

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	564,667	564,667	564,667	0	**1,694,000**
					CY/day	*0*	*0*	*0*	*18,562*	*18,562*	*18,562*		

2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City								10,000	10,000	10,000	10,000		40,000
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina								14,000	14,000	14,000	14,000		56,000
TOTAL	0	0	0	0	0	0	0	490,750	490,750	490,750	490,750	0	**1,963,000**
					CY/day	*0*	*0*	*16,132*	*16,132*	*16,132*	*16,132*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (SUPER OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Super Optimized

TOTALS	22,309,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2021

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	553,750	553,750	553,750	553,750	0	**2,215,001**
					CY/day	*0*	*0*	*18,203*	*18,203*	*18,203*	*18,203*		

2022

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel								62,000	62,000	62,000	62,000		248,000
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling								97,600	97,600	48,800			244,000
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	558,100	558,100	509,300	460,500	0	**2,086,000**
					CY/day	*0*	*0*	*18,346*	*18,346*	*16,742*	*15,138*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (SUPER OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Super Optimized

TOTALS	22,309,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2023

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor													0
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City													0
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel								68,250	68,250	68,250	68,250		273,000
BAE Systems								31,500	31,500	31,500	31,500		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	491,750	491,750	491,750	491,750	0	**1,967,000**
					CY/day	*0*	*0*	*16,165*	*16,165*	*16,165*	*16,165*		

2024

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor								183,500	183,500	183,500	183,500		734,000
Redwood City Harbor								117,750	117,750	117,750	117,750		471,000
Richmond Inner Harbor								63,250	63,250	63,250	63,250		253,000
Richmond Outer Harbor								45,000	45,000	45,000	45,000		180,000
Chevron								33,750	33,750	33,750	33,750		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)								23,250	23,250	23,250	23,250		93,000
Port of Redwood City								10,000	10,000	10,000	10,000		40,000
Port of San Francisco								43,250	43,250	43,250	43,250		173,000
Port of Richmond (Berths)								12,500	12,500	12,500	12,500		50,001
ConocoPhillips (Rodeo)								6,500	6,500	6,500	6,500		26,000
Alameda Point Channel													0
BAE Systems													0
Allied Defense Recycling													0
Emeryville Marina								14,000	14,000	14,000	14,000		56,000
TOTAL	0	0	0	0	0	0	0	552,750	552,750	552,750	552,750	0	**2,211,001**
					CY/day	*0*	*0*	*18,171*	*18,171*	*18,171*	*18,171*		

PREDICTED MATERIAL DELIVERY SCHEDULE
ALVISO (A9 - A15, 22.5 MCY) (SUPER OPTIMIZED)

Alviso (A9 - A15, 22.5 MCY) Super Optimized

TOTALS	22,309,004	MCY
	11	Years

Consultation Required
Annual predictions redistributed evenly over non-consultation periods.
Consultation Required (later half of month)

2025

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Oakland Inner & Outer Harbor									244,667	244,667	244,667		734,000
Redwood City Harbor													0
Richmond Inner Harbor									84,333	84,333	84,333		253,000
Richmond Outer Harbor									60,000	60,000	60,000		180,000
Chevron									45,000	45,000	45,000		135,000
Larkspur Ferry Channel													0
Port of Oakland (Berths)									31,000	31,000	31,000		93,000
Port of Redwood City													0
Port of San Francisco									57,667	57,667	57,667		173,000
Port of Richmond (Berths)													0
ConocoPhillips (Rodeo)													0
Alameda Point Channel													0
BAE Systems									42,000	42,000	42,000		126,000
Allied Defense Recycling													0
Emeryville Marina													0
TOTAL	0	0	0	0	0	0	0	0	564,667	564,667	564,667	0	**1,694,000**
					CY/day	*0*	*0*	*0*	*18,562*	*18,562*	*18,562*		

ATTACHMENT E

OFFLOADER COST ESTIMATE SUMMARY
EDEN LANDING (E1, E2, E4 - E7, E1C, E2C, E4C - E6C)
NON-OPTIMIZED, OPTIMIZED, AND SUPER OPTIMIZED SCHEDULES

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)

OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2013 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,782,001		1,069	1,121	$4,224	$9,250,560	1	$10,000	$279,000	$3,942,000	$13,481,560	$7.57	$404,447	$808,894	$3,370,390	$18,065,290	1.00	$18,065,290	$10.14	3.0
2016	1,257,000		754	1,436	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$7.65	$288,527	$577,054	$2,404,390	$12,887,530	1.02	$13,132,510	$10.45	3.0
2017	1,534,000	1,667	920	1,270	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$6.27	$288,527	$577,054	$2,404,390	$12,887,530	1.04	$13,395,085	$8.73	3.0
2018	2,174,001		1,304	1,616	$4,224	$12,334,080	8	$78,000	$279,000	$0	$12,691,080	$5.84	$380,732	$761,465	$3,172,770	$17,006,047	1.06	$18,029,434	$8.29	4.0
2019	734,000		440	1,750	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$13.10	$288,527	$577,054	$2,404,390	$12,887,530	1.08	$13,936,327	$18.99	3.0
	7,481,002		4,488	7,192		$49,336,320		$352,000	$1,395,000	$3,942,000	$55,025,320	$7.36	$1,650,760	$3,301,519	$13,756,330	$73,733,929		$76,558,647	$10.23	16.0
				16 months															*$/Mo*	*$4,784,915*
			280 Avg. Hrs/Mo unloading																	

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 7.2 MCY (1.0 MCY to E1, 0.1 MCY to E1C, 2.4 MCY to E2, <0.1 MCY to E2C, 0.5 MCY to E4, 0.8 MCY to E4C, 0.5 MCY to E5, 0.3 MCY to E5C, 0.5 MCY to E6, 0.2 MCY to E6C, and 0.8 MCY to E7).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

OFFLOADER COST ESTIMATE SUMMARY
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)

NON-OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,205,000		723	3,657	$3,814	$16,705,320	1	$10,000	$288,000	$3,940,000	$20,943,320	$17.38	$628,300	$1,256,599	$5,235,830	$28,064,049	1.00	$28,064,049	$23.29	6.0
2016	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.02	$23,285,833	$31.72	6.0
2017	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.04	$23,751,417	$32.36	6.0
2018	1,205,000	1,667	723	3,657	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$14.15	$511,600	$1,023,199	$4,263,330	$22,851,449	1.06	$24,226,600	$20.11	6.0
2019	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.08	$24,711,116	$33.67	6.0
2020	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.10	$25,205,231	$34.34	6.0
2021	1,205,000		723	3,657	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$14.15	$511,600	$1,023,199	$4,263,330	$22,851,449	1.13	$25,709,213	$21.34	6.0
2022	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.15	$26,223,595	$35.73	6.0
	7,285,000		4,370	30,670		$133,642,560		$430,000	$2,304,000	$3,940,000	$140,316,560	$19.26	$4,209,497	$8,418,994	$35,079,140	$188,024,190		$201,177,053	$27.62	48.0
				48 months															*$/Mo*	*$4,191,189*
				91 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 7.2 MCY (1.0 MCY to E1, 0.1 MCY to E1C, 2.4 MCY to E2, <0.1 MCY to E2C, 0.5 MCY to E4, 0.8 MCY to E4C, 0.5 MCY to E5, 0.3 MCY to E5C, 0.5 MCY to E6, 0.2 MCY to E6C, and 0.8 MCY to E7).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be spread evenly across the six month work window.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

OFFLOADER COST ESTIMATE SUMMARY
EDEN LANDING (E1, E2, E4-E7, E1C, E2C, E4C-E6C, 7.2 MCY)

SUPER OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	2,215,001	1,667	1,329	1,591	$4,290	$12,526,648	1	$10,000	$278,000	$3,942,000	$16,756,648	$7.57	$502,699	$1,005,399	$4,189,162	$22,453,908	1.00	$22,453,908	$10.14	4.0
2016	1,690,000		1,014	1,176	$4,290	$9,394,986	9	$90,000	$278,000	$0	$9,762,986	$5.78	$292,890	$585,779	$2,440,746	$13,082,401	1.02	$13,331,085	$7.89	3.0
2017	1,967,000		1,180	1,740	$4,290	$12,526,648	8	$80,000	$278,000	$0	$12,884,648	$6.55	$386,539	$773,079	$3,221,162	$17,265,428	1.04	$17,945,399	$9.12	4.0
2018	1,385,000		831	1,359	$4,290	$9,394,986	9	$90,000	$278,000	$0	$9,762,986	$7.05	$292,890	$585,779	$2,440,746	$13,082,401	1.06	$13,869,671	$10.01	3.0
	7,257,001		4,353	5,867		$43,843,267		$270,000	$1,112,000	$3,942,000	$49,167,267	$6.78	$1,475,018	$2,950,036	$12,291,817	$65,884,137		$67,600,063	$9.32	14.0
				14 months															*$/Mo*	*$4,828,576*
				311 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Redwood City, and Richmond (Inner & Outer) Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 7.2 MCY (1.0 MCY to E1, 0.1 MCY to E1C, 2.4 MCY to E2, <0.1 MCY to E2C, 0.5 MCY to E4, 0.8 MCY to E4C, 0.5 MCY to E5, 0.3 MCY to E5C, 0.5 MCY to E6, 0.2 MCY to E6C, and 0.8 MCY to E7).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

ATTACHMENT F

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A1, A2W)
NON-OPTIMIZED, OPTIMIZED, AND SUPER OPTIMIZED SCHEDULES

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A1, A2W, 8.2 MCY)

OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2013 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,782,001	1,667	1,069	1,121	$4,224	$9,250,560	1	$10,000	$279,000	$3,942,000	$13,481,560	$7.57	$404,447	$808,894	$3,370,390	$18,065,290	1.00	$18,065,290	$10.14	3.0
2016	1,257,000		754	1,436	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$7.65	$288,527	$577,054	$2,404,390	$12,887,530	1.02	$13,132,510	$10.45	3.0
2017	1,534,000		920	1,270	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$6.27	$288,527	$577,054	$2,404,390	$12,887,530	1.04	$13,395,085	$8.73	3.0
2018	2,174,001		1,304	1,616	$4,224	$12,334,080	8	$78,000	$279,000	$0	$12,691,080	$5.84	$380,732	$761,465	$3,172,770	$17,006,047	1.06	$18,029,434	$8.29	4.0
2019	1,261,000		756	1,434	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$7.63	$288,527	$577,054	$2,404,390	$12,887,530	1.08	$13,936,327	$11.05	3.0
2020	734,000		440	1,750	$4,224	$9,250,560	9	$88,000	$279,000	$0	$9,617,560	$13.10	$288,527	$577,054	$2,404,390	$12,887,530	1.10	$14,214,993	$19.37	3.0
	8,742,002		5,244	8,626		$58,586,880		$440,000	$1,674,000	$3,942,000	$64,642,880	$7.39	$1,939,286	$3,878,573	$16,160,720	$86,621,459		$90,773,640	$10.38	19.0
				19 months															*$/Mo*	*$4,777,560*
				276 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 8.2 MCY (3.0 MCY to A1 and 5.2 MCY to A2W).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A1, A2W, 8.2 MCY)

NON-OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,205,000		723	3,657	$3,814	$16,705,320	1	$10,000	$288,000	$3,940,000	$20,943,320	$17.38	$628,300	$1,256,599	$5,235,830	$28,064,049	1.00	$28,064,049	$23.29	6.0
2016	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.02	$23,285,833	$31.72	6.0
2017	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.04	$23,751,417	$32.36	6.0
2018	1,205,000		723	3,657	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$14.15	$511,600	$1,023,199	$4,263,330	$22,851,449	1.06	$24,226,600	$20.11	6.0
2019	734,000	1,667	440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.08	$24,711,116	$33.67	6.0
2020	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.10	$25,205,231	$34.34	6.0
2021	1,205,000		723	3,657	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$14.15	$511,600	$1,023,199	$4,263,330	$22,851,449	1.13	$25,709,213	$21.34	6.0
2022	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.15	$26,223,595	$35.73	6.0
2023	734,000		440	3,940	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$23.23	$511,600	$1,023,199	$4,263,330	$22,851,449	1.17	$26,748,109	$36.44	6.0
2024	471,000		283	4,097	$3,814	$16,705,320	6	$60,000	$288,000	$0	$17,053,320	$36.21	$511,600	$1,023,199	$4,263,330	$22,851,449	1.19	$27,283,024	$57.93	6.0
	8,490,000		5,093	38,707		$167,053,200		$550,000	$2,880,000	$3,940,000	$174,423,200	$20.54	$5,232,696	$10,465,392	$43,605,800	$233,727,088		$255,208,186	$30.06	60.0
				60 months															*$/Mo*	*$4,253,470*
				85 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 8.2 MCY (3.0 MCY to A1 and 5.2 MCY to A2W).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be spread evenly across the six month work window.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A1, A2W, 8.2 MCY)

SUPER OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	2,215,001	1,667	1,329	1,591	$4,300	$12,556,793	1	$10,000	$277,000	$3,942,000	$16,785,793	$7.58	$503,574	$1,007,148	$4,196,448	$22,492,963	1.00	$22,492,963	$10.15	4.0
2016	1,690,000		1,014	1,176	$4,300	$9,417,595	9	$90,000	$277,000	$0	$9,784,595	$5.79	$293,538	$587,076	$2,446,149	$13,111,357	1.02	$13,360,592	$7.91	3.0
2017	1,967,000		1,180	1,740	$4,300	$12,556,793	8	$80,000	$277,000	$0	$12,913,793	$6.57	$387,414	$774,828	$3,228,448	$17,304,483	1.04	$17,985,993	$9.14	4.0
2018	2,438,000		1,463	2,187	$4,300	$15,695,992	7	$70,000	$277,000	$0	$16,042,992	$6.58	$481,290	$962,580	$4,010,748	$21,497,609	1.06	$22,791,289	$9.35	5.0
	8,310,001		4,985	6,695		$50,227,174		$250,000	$1,108,000	$3,942,000	$55,527,174	$6.68	$1,665,815	$3,331,630	$13,881,793	$74,406,413		$76,630,836	$9.22	16.0
				16 months															*$/Mo*	*$4,789,427*
				312 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Redwood City, and Richmond (Inner & Outer) Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 8.2 MCY (3.0 MCY to A1 and 5.2 MCY to A2W).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

ATTACHMENT G

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A5, A7, A8, A8S)
NON-OPTIMIZED, OPTIMIZED, AND SUPER OPTIMIZED SCHEDULES

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A5, A7, A8, A8S, 17.0 MCY)

OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2013 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,782,001		1,069	1,121	$4,624	$10,126,560	1	$10,000	$279,000	$3,942,000	$14,357,560	$8.06	$430,727	$861,454	$3,589,390	$19,239,130	1.00	$19,239,130	$10.80	3.0
2016	1,257,000		754	1,436	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$8.35	$314,807	$629,614	$2,623,390	$14,061,370	1.02	$14,328,664	$11.40	3.0
2017	1,534,000		920	1,270	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.84	$314,807	$629,614	$2,623,390	$14,061,370	1.04	$14,615,155	$9.53	3.0
2018	2,174,001		1,304	1,616	$4,624	$13,502,080	8	$78,000	$279,000	$0	$13,859,080	$6.37	$415,772	$831,545	$3,464,770	$18,571,167	1.06	$19,688,740	$9.06	4.0
2019	1,261,000		756	1,434	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$8.32	$314,807	$629,614	$2,623,390	$14,061,370	1.08	$15,205,694	$12.06	3.0
2020	1,530,000	1,667	918	1,272	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.86	$314,807	$629,614	$2,623,390	$14,061,370	1.10	$15,509,743	$10.14	3.0
2021	1,782,001		1,069	1,121	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$5.89	$314,807	$629,614	$2,623,390	$14,061,370	1.13	$15,819,862	$8.88	3.0
2022	1,653,000		991	1,199	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.35	$314,807	$629,614	$2,623,390	$14,061,370	1.15	$16,136,381	$9.76	3.0
2023	1,534,000		920	1,270	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.84	$314,807	$629,614	$2,623,390	$14,061,370	1.17	$16,459,135	$10.73	3.0
2024	1,778,001		1,066	1,124	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$5.90	$314,807	$629,614	$2,623,390	$14,061,370	1.19	$16,788,288	$9.44	3.0
2025	734,000		440	1,750	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$14.30	$314,807	$629,614	$2,623,390	$14,061,370	1.22	$17,124,004	$23.33	3.0
	17,019,004		10,207	14,613		$114,767,680		$880,000	$3,069,000	$3,942,000	$122,658,680	$7.21	$3,679,760	$7,359,521	$30,664,670	$164,362,631		$180,914,796	$10.63	34.0
				34 months															*$/Mo*	*$5,321,023*
			300 Avg. Hrs/Mo unloading																	

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 17.0 MCY (6.6 MCY to A5, 2.3 MCY to A7, 5.9 MCY to A8, 2.1 MCY to A8S).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A5, A7, A8, A8S, 17.0 MCY)

NON-OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,205,000		723	3,657	$4,114	$18,019,320	1	$10,000	$288,000	$3,940,000	$22,257,320	$18.47	$667,720	$1,335,439	$5,564,330	$29,824,809	1.00	$29,824,809	$24.75	6.0
2016	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.02	$25,080,064	$34.17	6.0
2017	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.04	$25,581,521	$34.85	6.0
2018	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.06	$26,093,318	$21.65	6.0
2019	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.08	$26,615,167	$36.26	6.0
2020	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.10	$27,147,356	$36.99	6.0
2021	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.13	$27,690,171	$22.98	6.0
2022	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.15	$28,244,187	$38.48	6.0
2023	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.17	$28,809,117	$39.25	6.0
2024	1,205,000	1,667	723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.19	$29,385,247	$24.39	6.0
2025	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.22	$29,972,866	$40.83	6.0
2026	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.24	$30,572,260	$41.65	6.0
2027	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.27	$31,183,717	$25.88	6.0
2028	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.29	$31,807,523	$43.33	6.0
2029	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.32	$32,443,679	$44.20	6.0
2030	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.34	$33,092,473	$27.46	6.0
2031	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.37	$33,754,477	$45.99	6.0
2032	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.40	$34,429,406	$46.91	6.0
2033	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.43	$35,118,120	$29.14	6.0
	17,243,000		10,344	72,876		$342,367,080		$1,090,000	$5,472,000	$3,940,000	$352,869,080	$20.46	$10,586,072	$21,172,145	$88,217,270	$472,844,567		$566,845,479	$32.87	114.0
				114 months															*$/Mo*	*$4,972,329*
				91 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 17.0 MCY (6.6 MCY to A5, 2.3 MCY to A7, 5.9 MCY to A8, 2.1 MCY to A8S).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be spread evenly across the six month work window.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A5, A7, A8, A8S, 17.0 MCY)

SUPER OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	2,215,001		1,328	1,592	$4,610	$13,460,155	1	$10,000	$279,000	$3,942,000	$17,691,155	$7.99	$530,735	$1,061,469	$4,422,789	$23,706,147	1.00	$23,706,147	$10.70	4.0
2016	1,690,000		1,014	1,176	$4,610	$10,095,116	9	$90,000	$279,000	$0	$10,464,116	$6.19	$313,923	$627,847	$2,616,029	$14,021,915	1.02	$14,288,459	$8.45	3.0
2017	1,967,000		1,180	1,740	$4,610	$13,460,155	8	$80,000	$279,000	$0	$13,819,155	$7.03	$414,575	$829,149	$3,454,789	$18,517,667	1.04	$19,246,956	$9.78	4.0
2018	2,607,001		1,563	2,087	$4,610	$16,825,193	7	$70,000	$279,000	$0	$17,174,193	$6.59	$515,226	$1,030,452	$4,293,548	$23,013,419	1.06	$24,398,317	$9.36	5.0
2019	1,694,000	1,667	1,016	1,904	$4,610	$13,460,155	8	$80,000	$279,000	$0	$13,819,155	$8.16	$414,575	$829,149	$3,454,789	$18,517,667	1.08	$20,024,648	$11.82	4.0
2020	1,963,000		1,177	1,743	$4,610	$13,460,155	8	$80,000	$279,000	$0	$13,819,155	$7.04	$414,575	$829,149	$3,454,789	$18,517,667	1.10	$20,425,054	$10.41	4.0
2021	2,215,001		1,328	1,592	$4,610	$13,460,155	8	$80,000	$279,000	$0	$13,819,155	$6.24	$414,575	$829,149	$3,454,789	$18,517,667	1.13	$20,833,456	$9.41	4.0
2022	2,086,000		1,251	1,669	$4,610	$13,460,155	8	$80,000	$279,000	$0	$13,819,155	$6.62	$414,575	$829,149	$3,454,789	$18,517,667	1.15	$21,250,285	$10.19	4.0
2023	734,000		440	1,750	$4,610	$10,095,116	9	$90,000	$279,000	$0	$10,464,116	$14.26	$313,923	$627,847	$2,616,029	$14,021,915	1.17	$16,412,952	$22.36	3.0
	17,171,003		10,298	15,252		$117,776,352		$660,000	$2,511,000	$3,942,000	$124,889,352	$7.27	$3,746,681	$7,493,361	$31,222,338	$167,351,732		$180,586,272	$10.52	35.0
				35 months															*$/Mo*	*$5,159,608*
				294 Avg. Hrs/Mo unloading																

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Redwood City, and Richmond (Inner & Outer) Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 17.0 MCY (6.6 MCY to A5, 2.3 MCY to A7, 5.9 MCY to A8, 2.1 MCY to A8S).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

ATTACHMENT H

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A9 – A15)
NON-OPTIMIZED, OPTIMIZED, AND SUPER OPTIMIZED SCHEDULES

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A9 - A15, 22.5 MCY)

OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2013 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,782,001		1,068	1,122	$4,624	$10,126,560	1	$10,000	$279,000	$3,942,000	$14,357,560	$8.06	$430,727	$861,454	$3,589,390	$19,239,130	1.00	$19,239,130	$10.80	3.0
2016	1,257,000		754	1,436	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$8.35	$314,807	$629,614	$2,623,390	$14,061,370	1.02	$14,328,664	$11.40	3.0
2017	1,534,000		920	1,270	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.84	$314,807	$629,614	$2,623,390	$14,061,370	1.04	$14,615,155	$9.53	3.0
2018	2,174,001		1,303	1,617	$4,624	$13,502,080	8	$78,000	$279,000	$0	$13,859,080	$6.37	$415,772	$831,545	$3,464,770	$18,571,167	1.06	$19,688,740	$9.06	4.0
2019	1,261,000		756	1,434	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$8.32	$314,807	$629,614	$2,623,390	$14,061,370	1.08	$15,205,694	$12.06	3.0
2020	1,530,000		917	1,273	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.86	$314,807	$629,614	$2,623,390	$14,061,370	1.10	$15,509,743	$10.14	3.0
2021	1,782,001	1,668	1,068	1,122	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$5.89	$314,807	$629,614	$2,623,390	$14,061,370	1.13	$15,819,862	$8.88	3.0
2022	1,653,000		991	1,199	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.35	$314,807	$629,614	$2,623,390	$14,061,370	1.15	$16,136,381	$9.76	3.0
2023	1,534,000		920	1,270	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$6.84	$314,807	$629,614	$2,623,390	$14,061,370	1.17	$16,459,135	$10.73	3.0
2024	1,778,001		1,066	1,124	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$5.90	$314,807	$629,614	$2,623,390	$14,061,370	1.19	$16,788,288	$9.44	3.0
2025	1,261,000		756	1,434	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$8.32	$314,807	$629,614	$2,623,390	$14,061,370	1.22	$17,124,004	$13.58	3.0
2026	1,926,000		1,155	1,765	$4,624	$13,502,080	8	$78,000	$279,000	$0	$13,859,080	$7.20	$415,772	$831,545	$3,464,770	$18,571,167	1.24	$23,068,330	$11.98	4.0
2027	1,782,001		1,068	1,122	$4,624	$10,126,560	9	$88,000	$279,000	$0	$10,493,560	$5.89	$314,807	$629,614	$2,623,390	$14,061,370	1.27	$17,815,784	$10.00	3.0
2028	1,257,000		754	1,436	$4,624	$10,126,560	8	$78,000	$279,000	$0	$10,483,560	$8.34	$314,507	$629,014	$2,620,890	$14,047,970	1.29	$18,154,858	$14.44	3.0
	22,511,005		13,495	18,625		$148,522,880		$1,124,000	$3,906,000	$3,942,000	$157,494,880	$7.00	$4,724,846	$9,449,693	$39,373,720	$211,043,139		$239,953,767	$10.66	44.0
				44 months															*$/Mo*	*$5,453,495*
			307 Avg. Hrs/Mo unloading																	

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 22.5 MCY (2.8 MCY to A9, 2.5 MCY to A10, 3.3 MCY to A11, 4.4 MCY to A12, 3.4 MCY to A13, 3.4 MCY to A14, and 2.7 MCY to A15).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A9 - A15, 22.5 MCY)

NON-OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	1,205,000		723	3,657	$4,114	$18,019,320	1	$10,000	$288,000	$3,940,000	$22,257,320	$18.47	$667,720	$1,335,439	$5,564,330	$29,824,809	1.00	$29,824,809	$24.75	6.0
2016	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.02	$25,080,064	$34.17	6.0
2017	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.04	$25,581,521	$34.85	6.0
2018	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.06	$26,093,318	$21.65	6.0
2019	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.08	$26,615,167	$36.26	6.0
2020	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.10	$27,147,356	$36.99	6.0
2021	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.13	$27,690,171	$22.98	6.0
2022	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.15	$28,244,187	$38.48	6.0
2023	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.17	$28,809,117	$39.25	6.0
2024	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.19	$29,385,247	$24.39	6.0
2025	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.22	$29,972,866	$40.83	6.0
2026	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.24	$30,572,260	$41.65	6.0
2027	1,205,000	1,667	723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.27	$31,183,717	$25.88	6.0
2028	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.29	$31,807,523	$43.33	6.0
2029	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.32	$32,443,679	$44.20	6.0
2030	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.34	$33,092,473	$27.46	6.0
2031	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.37	$33,754,477	$45.99	6.0
2032	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.40	$34,429,406	$46.91	6.0
2033	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.43	$35,118,120	$29.14	6.0
2034	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.46	$35,820,333	$48.80	6.0
2035	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.48	$36,536,907	$49.78	6.0
2036	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.51	$37,267,553	$30.93	6.0
2037	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.54	$38,012,847	$51.79	6.0
2038	734,000		440	3,940	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$25.02	$551,020	$1,102,039	$4,591,830	$24,612,209	1.58	$38,773,075	$52.82	6.0
2039	1,205,000		723	3,657	$4,114	$18,019,320	6	$60,000	$288,000	$0	$18,367,320	$15.24	$551,020	$1,102,039	$4,591,830	$24,612,209	1.61	$39,548,525	$32.82	6.0
	22,589,000		13,551	95,949		$450,483,000		$1,450,000	$7,200,000	$3,940,000	$463,073,000	$20.50	$13,892,190	$27,784,380	$115,768,250	$620,517,820		$792,804,718	$35.10	150.0
				150 months															*$/Mo*	*$5,285,365*
			90 Avg. Hrs/Mo unloading																	

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland and Redwood City Federal Maintenance Dredging Projects.
4.) Total volume considered for the project is 22.5 MCY (2.8 MCY to A9, 2.5 MCY to A10, 3.3 MCY to A11, 4.4 MCY to A12, 3.4 MCY to A13, 3.4 MCY to A14, and 2.7 MCY to A15).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and are assumed to be spread evenly across the six month work window.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.

SBSP RESTORATION PROJECT
BENEFICIAL REUSE FEASIBILITY

OFFLOADER COST ESTIMATE SUMMARY
ALVISO (A9 - A15, 22.5 MCY)

SUPER OPTIMIZED SCHEDULE

Year	Predicted Dredging Quantity (CY)	Production Rate (CY/hr)	Unloading Time (Hrs)	Op. Standby Time (Hrs)	Unloading Cost ($/hr)	Unloading Cost ($)	Maintenance of Facility during Non-Unloading (Months)	($)	Interim Mob/Demob ($)	Mob/Demob (initial) ($)	Cost Subtotal ($)	Unit Cost ($/cy)	Design Fee @ 3% ($)	CM @ 6% ($)	Contingency @ 25% ($)	Cost to CCC in 2015 dollars ($)	Escalation ($)	Totals Cost	Totals Unit Cost	Duration (Months)
2015	2,215,001		1,328	1,592	$4,635	$13,533,241	1	$10,000	$279,000	$3,942,000	$17,764,241	$8.02	$532,927	$1,065,854	$4,441,060	$23,804,083	1.00	$23,804,083	$10.75	4.0
2016	1,690,000		1,013	1,177	$4,635	$10,149,931	9	$90,000	$279,000	$0	$10,518,931	$6.22	$315,568	$631,136	$2,629,733	$14,095,367	1.02	$14,363,307	$8.50	3.0
2017	1,967,000		1,179	1,741	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$7.06	$416,767	$833,534	$3,473,060	$18,615,603	1.04	$19,348,749	$9.84	4.0
2018	2,607,001		1,563	2,087	$4,635	$16,916,551	7	$70,000	$279,000	$0	$17,265,551	$6.62	$517,967	$1,035,933	$4,316,388	$23,135,839	1.06	$24,528,104	$9.41	5.0
2019	1,694,000		1,016	1,904	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$8.20	$416,767	$833,534	$3,473,060	$18,615,603	1.08	$20,130,554	$11.88	4.0
2020	1,963,000	1,667	1,177	1,743	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$7.08	$416,767	$833,534	$3,473,060	$18,615,603	1.10	$20,533,078	$10.46	4.0
2021	2,215,001		1,328	1,592	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$6.27	$416,767	$833,534	$3,473,060	$18,615,603	1.13	$20,943,640	$9.46	4.0
2022	2,086,000		1,251	1,669	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$6.66	$416,767	$833,534	$3,473,060	$18,615,603	1.15	$21,362,673	$10.24	4.0
2023	1,967,000		1,179	1,741	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$7.06	$416,767	$833,534	$3,473,060	$18,615,603	1.17	$21,789,961	$11.08	4.0
2024	2,211,001		1,325	1,595	$4,635	$13,533,241	8	$80,000	$279,000	$0	$13,892,241	$6.28	$416,767	$833,534	$3,473,060	$18,615,603	1.19	$22,225,721	$10.05	4.0
2025	1,694,000		1,016	1,174	$4,635	$10,149,931	8	$80,000	$279,000	$0	$10,508,931	$6.20	$315,268	$630,536	$2,627,233	$14,081,967	1.22	$17,149,087	$10.12	3.0
	22,309,004		13,374	18,016		$145,482,342		$810,000	$3,069,000	$3,942,000	$153,303,342	$6.87	$4,599,100	$9,198,201	$38,325,835	$205,426,478		$226,178,957	$10.14	43.0
				43 months															*$/Mo*	*$5,259,976*
			311 Avg. Hrs/Mo unloading																	

Cost Estimate Assumptions:

1.) No costs are included for disposal site preparation, rehandling or any other upland infrastructure placement requirements.
2.) No costs are included for real estate transfer fees, environmental documentation, permitting, mitigation and/or monitoring, program management costs or other associated fees.
3.) The costs and quantities are for the Oakland, Redwood City, and Richmond (Inner & Outer) Federal Maintenance Dredging Projects along with mid-sized non-federal projects including ports and private dredgers.
4.) Total volume considered for the project is 22.5 MCY (2.8 MCY to A9, 2.5 MCY to A10, 3.3 MCY to A11, 4.4 MCY to A12, 3.4 MCY to A13, 3.4 MCY to A14, and 2.7 MCY to A15).
5.) Dredging projects are scheduled to fit within the San Francisco Bay Dredging Work Windows and have been optimized to be completed based on a the minimum monthly productions using four large dump scows.
6.) Unloading equipment hourly costs are based on the Hamilton Wetlands Restoration Project (BMK V) Offloader Cost Estimate dated May 2013.
7.) Costs and dredging cycles are based on a single Unloader contract.
8.) Mob/Demob costs include booster pump installation, pipeline installation, and diesel generator installation costs.
9.) All equipment costs assume diesel engines for the Offloader and Booster Pump.
10.) The Offloader, booster pump and support barges will be demobilized at the end of the year and taken offsite. Only the mooring dolphin piles and pipeline will remain onsite.
11.) Costs have been included to maintain site security, pumps, navigation lights on the mooring pile dolphins, and inspect the placement site during the non-unloading periods.
12.) Costs have been escalated to reflect the year in which construction could take place based on USACE EM 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) using Table A-2 from Amendment #4 updated 31 March 2014.