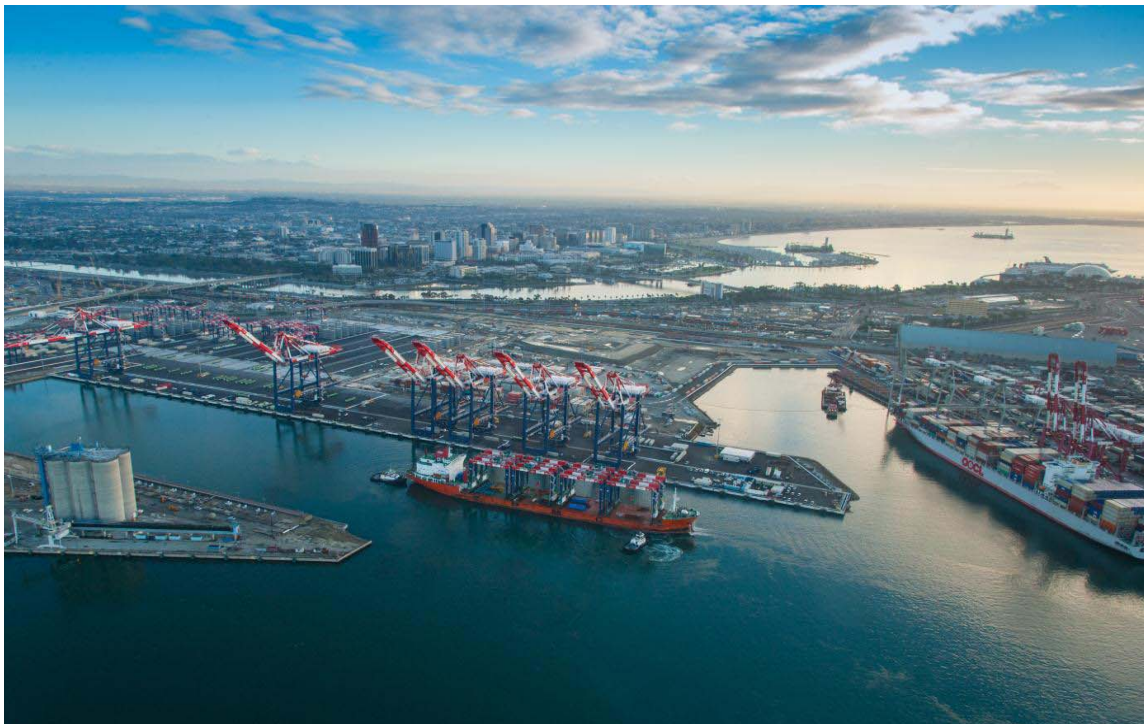


Beneficial Reuse of Dredged Sediments in the Middle Harbor Slip 1 Fill

Port of Long Beach

Category: Environmental Enhancement



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Introduction

Dredging is essential to maintaining navigation in channels and harbors. However, disposal of dredged sediments, especially contaminated sediments, in a sustainable and cost-effective manner is often a challenge for both Port of Long Beach (Port) and regional dredging projects. One sustainable and preferential disposal option is to beneficially reuse dredged sediments in a Port development fill (i.e. confined disposal facility or CDF) to create new land. The Port has been fortunate to be able to align Port dredging projects with Port development fill projects. The most recent example is the Port's Middle Harbor Terminal Redevelopment Project (Project).

As part of Phase 1 of the Project, Slip 1 was filled in to create new land for terminal development. During the design of the Middle Harbor Slip 1 fill, a unique opportunity presented itself in which additional fill material, in excess of Project dredge material, was needed to complete the fill. In keeping with the Port's Green Port Policy, the Port made a voluntary decision to open up the Slip 1 fill site for acceptance of outside third party material from the greater Southern California region.

Through the early establishment of a comprehensive and transparent selection process, the Port, in conjunction with the Los Angeles Contaminated Sediments Task Force (CSTF), was able to successfully identify candidate projects interested in and qualified for contributing dredged material to the Slip 1 fill site. Individual projects were evaluated for compatibility with the Project construction schedule and material characteristics requirements. The process resulted in close to 1 million cubic yards (cy) of contaminated third party material being sequestered in the Slip 1 fill site. This provided a mutually beneficial partnership in which the Port was able to cost-effectively complete the construction of the fill and provide an environmentally sustainable and cost-effective disposal option that otherwise would not have been available, for third parties in the Southern

California region. In some cases the availability of a cost-effective sediment disposal option allowed regional projects which were considered economically infeasible otherwise, to proceed.

Goals and Objectives

The Port's primary objectives for the Phase 1 Middle Harbor Slip 1 fill were to:

- Construct a cost-effective and structurally sound fill to support a modern marine container terminal, within the time constraints of the overall terminal construction schedule.
- Accommodate dredge material from the Middle Harbor Project and other Port projects and maximize, to the extent feasible, the opportunity to accept contaminated sediment from the region within the slip fill.
- Develop a comprehensive and transparent process to identify and solicit candidate projects interested in and qualified for contributing dredged material to the slip fill.
- Provide an opportunity to develop a management strategy and methodology for the beneficial reuse of 2.5 million cys of contaminated sediments (i.e. regulatory defined but not hazardous waste) from within the Port and around the region.

Discussion

A. Background

The Port of Long Beach is the second largest seaport in the United States and a major gateway for trade in and out of the country. The Port is currently working on the Middle Harbor Terminal Redevelopment Project, a 9-year, \$1.314 billion construction project. This project includes filling in Slip 1 and the East Basin to create approximately 65 acres of new land and combine two aging container terminals into one of the world's most technologically advanced and most sustainable container shipping terminals. Construction of this state-of-the-art terminal began in 2011 and has

been broken up into multiple construction phases and stages. The first phase of the Project included the Slip 1 fill which required approximately 2.7 million cy of fill material. The Phase 1 Slip 1 Fill site was completed in March 2015 and the first phase of the completed terminal was delivered to the tenant at the end of 2015. The East Basin Fill and the full Middle Harbor terminal build-out are scheduled to be completed in 2020.

Sequestration of dredge sediments in a port development fill is one of the preferred beneficial re-use strategies because it is cost-effective and highly protective of the environment. The Los Angeles CSTF focuses on the management of contaminated sediments in the Los Angeles area and has, through its long-term management strategy document, identified beneficial reuse of contaminated sediments as the preferred disposal option for dredging projects in the Los Angeles County region. The CSTF is a multi-agency group that includes representatives from the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, California Coastal Commission, Los Angeles Regional Water Quality Control Board, California Department of Fish and Game, Port of Long Beach, Port of Los Angeles, City of Long Beach, Los Angeles County Beaches and Harbors, Heal the Bay, and other interested parties.

The Port has previously accepted contaminated dredged material from outside the harbor into its fills. For example, Marina del Rey and Los Angeles River sediments were placed in the Pier E Slip 2 fill in 1999 and City of Long Beach Catalina Landing sediments in the Pier G North Slip Fill in 2010. The Port continues to be committed to the CSTF strategy of accommodating third-party material whenever feasible.

B. Objectives and Methodology

In order to facilitate the solicitation and acceptance of third party material and meet the objectives for the Slip 1 fill construction, the Port developed a comprehensive and transparent selection process and established a set of criteria for ranking candidate sources of third-party material. This process consisted of the following sequential steps:

- 1. Solicit Applications:** An application and required documentation list were developed. CSTF e-mail contacts and meetings were used to distribute the application form and background materials to all potentially interested entities. The application materials were also made available on the Port's website.
- 2. Evaluate and Rank Applications:** The Port's environmental and engineering staff evaluated the applications and ranked them in accordance with established criteria in regards to each project's material suitability (chemical and geotechnical), anticipated schedule, geographical location, and ability to obtain all appropriate permits and entitlements.
- 3. Present Applications to CSTF:** The rankings and tentative fill plan were presented to the CSTF to ensure full communication and to allow interested parties the opportunity to suggest revisions to the rankings based on any new information. This provided an opportunity to conduct negotiations among the agencies and third parties in order to increase the chance that regional goals for contaminated sediment management could be achieved.

4. **Final Decision and Approval:** CSTF's input was incorporated and any adjustment of rankings made. A final list of projects and fill plan were prepared and provided to the Port's Board of Harbor Commissioners for approval.

5. **Prepare Third Party Fill Plans and Execute MOAs:** The Port's engineering and legal staff worked with each selected third party to prepare and finalize project specific fill plans and memoranda of agreement (MOAs) that established placement windows and other legal/logistical requirements for delivery of the material. Once executed by the responsible third-party entities, the MOAs were presented to the Board of Harbor Commissioners for approval. The third party then delivered the material in accordance with the requirements in their project specific fill plan.

C. Fulfillment of Awards Criteria

1. Benefits to Environment and Community

The beneficial reuse of contaminated material in the Phase 1 Middle Harbor Slip 1 Fill site provided a cost-effective and environmentally protective solution for contaminated sediments within the Southern California region from Marina del Rey, the Port/City of Long Beach, and Newport Beach. The Project was successful in providing a greater than 90% beneficial reuse rate for all dredge material produced in the Los Angeles and Orange County region within the 2-year period of 2011-2012.

The Project benefitted the marine environment by reducing impacts to water quality and benthic organisms. The request for third party material provided a catalyst for the removal of close to 1 million cy of contaminated sediments within southern California's waterways, that otherwise may not have occurred due to the prohibitive costs of drying, processing, trucking, and disposing

of the material in an upland landfill. Sediments containing heavy metals (e.g. copper, lead, zinc, mercury), pesticides (e.g. DDT and chlordane), and polychlorinated biphenyls (PCBs) were removed from the marine environment and sequestered in a fill site engineered to safely contain chemically impacted materials. For example, it is estimated that one of the third party projects, the Colorado Lagoon project in Long Beach, dredged approximately 80,000 cy of sediment resulting in more than 5,000 pounds of copper, 17,000 pounds of lead, and 23,000 pounds of zinc being removed from the marine environment and placed in the fill site.

2. Independent Involvement and Effort

The third party fill material solicitation process was a voluntary effort, honoring the Port's commitment to the Port's Green Port Policy and the CSTF long-term management strategy for beneficial reuse. It was developed and implemented entirely by Port staff, with assistance from the CSTF. Advanced planning was extremely important as well as close coordination between Port staff (engineering, environmental, construction, and legal), consultants, and selected third parties to successfully implement and complete the project. Because of the strong internal partnerships between Port staff and their consultants and strong external partnerships with regulatory agencies, the Port was able to efficiently implement the solicitation process and coordinate the construction process that resulted in the successful placement of contaminated sediments from outside the Port.

This was all completed under a relatively short timeframe, about 3 years. It took a little over 1 year to develop the process, evaluation criteria, and to solicit and select parties. The third parties were given a 2-year time window in which material was required to be delivered to the

fill site so that it could be placed in the appropriate layer of the fill, based on geotechnical and chemical characteristics.

3. Creativity

The approach used by the Port to plan and construct the project was innovative in that it provided a mutually beneficial solution for the Port and the region. While the Port has accommodated third party material in previous development fill projects, this was noteworthy as it was the first time the Port formally solicited for a large volume of third party material and was the first time something of this scale was done in the region.

Due to limited disposal locations for contaminated sediment within the region, the Port anticipated there would be many interested third parties. Accordingly, the Port worked on developing a transparent and efficient method to screen sources. The Port also utilized the existing structure of the CSTF to solicit third parties, inform them of the process, and receive input on the selection process. Utilizing the CSTF helped to involve all the key agencies that regulate dredging and fill activities, environmental groups such as Heal the Bay, and organizations involved in dredging. In addition, the entire design of the fill site was developed to accept third party material accounting for varying project schedules, disposal methods, and material of varying geotechnical quality.

The Port could have elected to locate a borrow area from within the harbor and mine the sediment needed to complete the Slip 1 fill. Instead the Port voluntarily developed a creative solution that met both the Port's needs and the needs of the region for an environmentally protective disposal site for contaminated material.

4. Project Results

The Port received applications from 11 individual projects, totaling over 4 million cy of material. Out of those applications, nine projects were selected resulting in close to 1 million cy of contaminated material being beneficially reused in the Slip 1 fill site. Individual third party projects and approximate volumes placed in the Slip 1 fill included:

City/Organization	Project	Approx. Volume (cubic yards)
Los Angeles County Beaches and Harbors	Marina del Rey Federal Channel	475,000
City of Newport Beach	Rhine Channel	85,000
City of Newport Beach	Lower Newport Bay Federal Channel	130,000
City of Long Beach	Colorado Lagoon	80,000
City of Long Beach	Alamitos Marina	42,000
City of Long Beach	Harborlight Marina	6,000
U.S. Army Corps of Engineers	Los Angeles River Estuary	100,000
City of Long Beach	Rainbow Harbor	75,000
Eagle Rock Aggregates	Long Beach Pier D, Berth 44	6,000
	Total	999,000

The Slip 1 fill was completed in 2015 and all selected third party material was accommodated within the fill site. Work is now starting on the next phase of the fill, the East Basin Fill, in which material from within the Port will be beneficially reused within the fill.

5. Cost-Effectiveness

In addition to providing environmental benefits, this project also provided a cost-effective solution for the Port and third parties. In Southern California, management options for contaminated sediment disposal are limited to upland landfill or reuse within a Port fill development project. The current cost for dredging, dewatering, and upland disposal at a commercial landfill is approximately \$100 to \$150 per cy, rendering many projects economically infeasible if upland disposal is the only available disposal option. The average cost for dredging

and disposal within the Middle Harbor Fill Site was approximately \$25-\$30 per cy. There was no tipping fee for use of the disposal facility. Therefore, the savings for the Third parties was approximately \$125 million. Likewise, there was a significant cost savings to the Port, as receiving the material offset the need to import fill material from other sources or mine it from within the outer harbor. Dredging for borrow material would cost about \$12 per cy. Receiving the third party material for no charge saved the Port about \$12 million.

6. Transferability

This process could be adapted and replicated by other seaports if a similar opportunity presents itself and there is a significant regional need for disposal sites for contaminated material. This project can serve as a model for other fill sites, and demonstrates that the complex process of accepting and managing contaminated sediments from multiple entities is feasible and can be done safely with a well-coordinated construction plan. By establishing strong internal partnerships and coordination between Port Engineers and Environmental Planning staff, their consultants, and strong external partnerships with regulatory agencies, the Port was able to implement the solicitation process and coordinate the construction process that resulted in the successful placement of contaminated sediments from outside the Port. In addition, being able to provide a clear process to stakeholders can lead to a more efficient long-term management of contaminated sediments. Construction schedules or project budgets were not impacted, in part due to the development of a clear and open selection process, adherence to MOAs, and open and frequent communication between all parties during disposal operations. The lessons learned during this process could be transferable to port projects elsewhere.

Conclusion

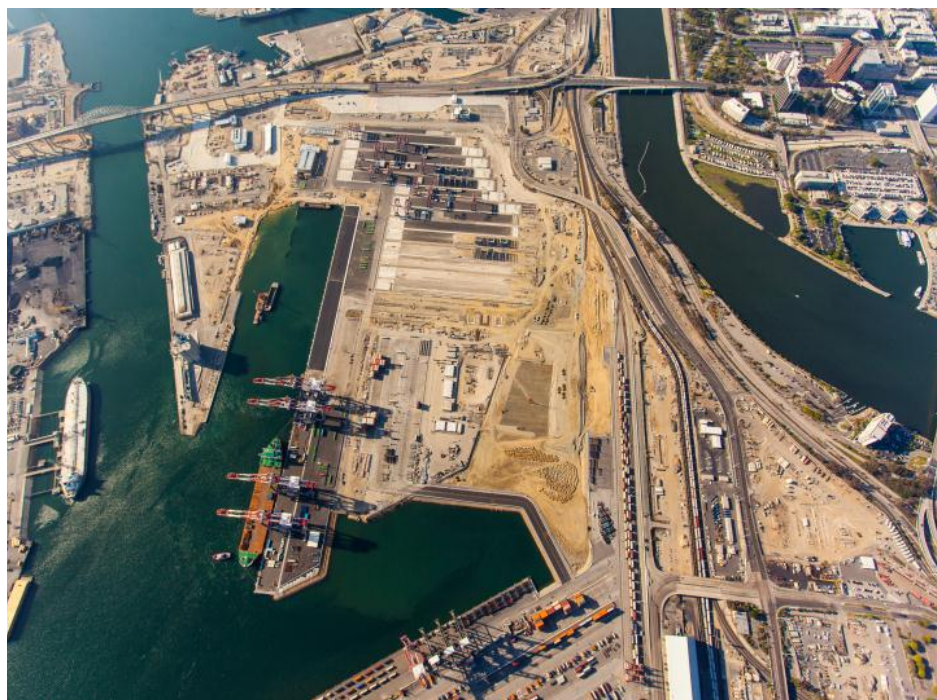
The beneficial reuse of dredged sediment in the Slip 1 fill was a unique opportunity for a seaport to work in coordination with its regional partners and regulatory agencies to address a regional sediment issue and to reduce water quality and benthic community impacts from contaminated sediment. The solicitation and selection process and coordination of third party material in the fill site was successful because the objectives and process for the fill site and third party acceptance were established in advance and well communicated to all the parties involved. Although there were nine separate projects providing material, everyone's goals aligned, and through close coordination everyone worked together to successfully complete the fill within the overall Middle Harbor Terminal Redevelopment construction schedule.



Middle Harbor Terminal
Before Construction



Artist's Rendition of Completed Middle
Harbor Terminal Redevelopment



Completed Phase 1 Slip 1 Fill