LOS ANGELES DREDGE MATERIAL MANAGEMENT PLAN (DMMP)

PROJECT DESCRIPTIONS AND ALTERNATIVES DEVELOPMENT

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1. Overview

The objective of the Los Angeles (LA) Regional Dredge Material Management Plan (DMMP) is to develop a long-term strategy and work plan for managing dredge material disposal within the region. The DMMP is comprised of two main components – an overall management summary report and a programmatic Environmental Impact Statement (EIS) – as well as several technical appendices and pilot studies conducted under previous contracts to support the technical evaluations presented in the DMMP. The DMMP report will summarize the future disposal need (twenty years) for the region, the expected physical and chemical characteristics of the dredge material, the potential available treatment and disposal alternatives in the region, and a strategy in evaluating and selecting the appropriate management alternatives. Figure 1.1 presents an example decision tree for the DMMP report to outline the range of potential alternatives currently available for either clean or contaminated dredge material.

The programmatic EIS will evaluate all the alternatives that are being considered in the DMMP report. However, since the DMMP is developed to provide a long-term dredge material management plan for the entire Los Angeles Region, the programmatic EIS will not be developed for any particular project. For the programmatic EIS to be useful for future application, it will be developed using a range of hypothetical project scenarios representative of most dredging projects in the region. Each of the project scenarios will be evaluated for the appropriate alternatives listed in Figure 1.1 suitable for the specific characteristics of each project scenario. Using this approach, future projects considering one or more of these management alternatives can rely on this document to support their corresponding project specific evaluations. Each alternative will have detailed information provided therefore on the impacts of that alternative under a variety of scenarios.

Descriptions for the project scenarios (conditions) developed for the DMMP are provided in Section 2, followed by the descriptions of the management alternatives in Section 3.

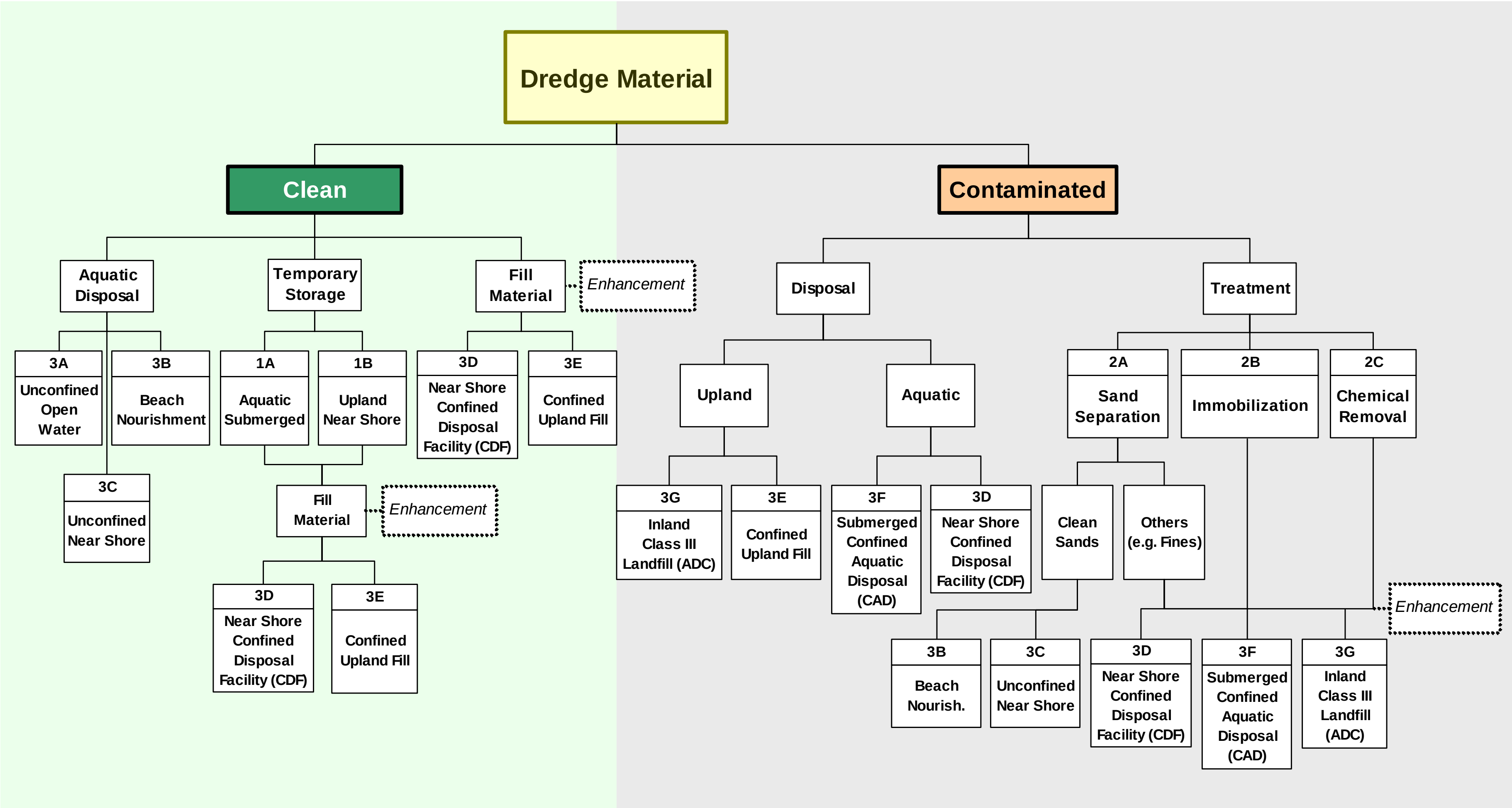

Figure 1.1 DMMP Management Alternatives

2. PROJECT SCENARIOS

Three project scenarios (conditions) were developed after analyzing the historical dredging records for the region. The selection of the project scenarios has considered different dredging needs for the region, the physical and chemical characteristics of the dredge material, the dredge locations, as well as typical dredged quantities. Based on the analyses of historical dredging records and the expected dredging need for the region, three project scenarios were developed for the programmatic EIS. These three scenarios are:

Scenario 1 – Capital improvement projects (new work) dredging consisting primarily of clean material derived from native materials below current authorized depths.

Scenario 2 – Navigation channel maintenance projects (e.g. Marina del Rey and Los Angeles River Estuary) consisting of a mix of clean and contaminated material with high sand content.

Scenario 3 – Berth maintenance projects consisting primarily of fine grained sediments containing a mix of clean and contaminated material.

Detailed descriptions, along with a summary of suitable management alternatives for these three project scenarios, are provided below.

2.1 PROJECT SCENARIO 1 – CHANNEL DEEPENING AND CAPITAL IMPROVEMENT PROJECT DREDGING – NEW WORK MATERIAL

This project scenario represents the channel deepening and capital improvement projects for the Port of Los Angeles and the Port of Long Beach. Historically, channel deepening and capital improvement accounts for the majority of disposal need for the two Ports. Between 1978 and 2002, capital improvement projects accounted for over 96 percent of dredging and disposal needs for the Port of Los Angeles (USACE 2004). Similarly, for the Port of Long Beach, capital improvement projects accounted for 88 percent of the dredge material between 1976 and 2003 (USACE 2004). Typically, channel deepening and capital improvement projects involve dredging in excess of 500,000 m^3. For example, the current channel deepening project for the Main Channel, East Basin and West Basin in the POLA will result in approximately 8 million m^3 of dredged sediment.

Dredge materials under Project Scenario 1 are considered as “new work” because they represent sediments that have not been dredged previously. This material is expected to consist of medium to coarse sands, and occasionally the underlying native clay layers. The material is almost always suitable for open water disposal due to low chemical concentrations; and, unless the material contains clay, is also suitable for beach nourishment. Geotechnically, however, this material is ideal for construction projects such as terminal fill sites or as surcharge for completed fill projects so there is usually a goal for reusing this material as construction fill either immediately or stored for future use.

The programmatic EIS will evaluate this project scenario against the alternatives shown in Figure 1.1 that are suitable for this scenario. The appropriate alternatives for Project Scenario 1 are shown in "blue" in Figure 2.1.

2.2 PROJECT SCENARIO 2 – NAVIGATION CHANNEL AND TURNING BASIN MAINTENANCE DREDGING

This project scenario represents the most common dredging scenario in the region from a frequency standpoint. Dredging is typically required every 2 to 3 years, with events averaging between 150,000 and 250,000 m^3. The material is mostly sand (70-90 percent) and comes from the navigation channels located at the terminus of the Los Angeles River Estuary (LARE) and Ballona Creek, and from the regional Harbor entrance channels as a result of beach migration (e.g., Ventura, Channel Islands Harbor, and Oceanside). The material originating from the LARE and Ballona Creek includes significant organic material and trash debris as a result of urban runoff from the Los Angeles County watershed. The material from the other regional harbor entrance channels usually contains minimal organic material and trash debris.

Chemical concentrations for this material varies widely with some projects containing very low amounts (below Effects Range Low (ERL) screening values), making them suitable for many reuse options, while others contain elevated concentrations (between ERL and Effects Range Median (ERM) screening values) making them unsuitable for in-water management options. A small percentage of the projects may even contain chemical concentrations above the ERM upper screening values, which may suggest an even more limited range of available management alternatives available for use within the region.

A representative project would be dredging the Marina del Rey entrance channel. The Corps anticipates dredging this area at a rate of 150,000 to 300,000 m^3 every three years, which is consistent with the historical dredging rate. It is estimated that about one-fourth to one-half of the dredge volume will be contaminated, and not suitable for unconfined, open-water disposal. In this example, the projected rate is expected to continue until a sediment control alternative is implemented. This area also represents the urban nature of the runoff and contains a high volume of trash and debris.

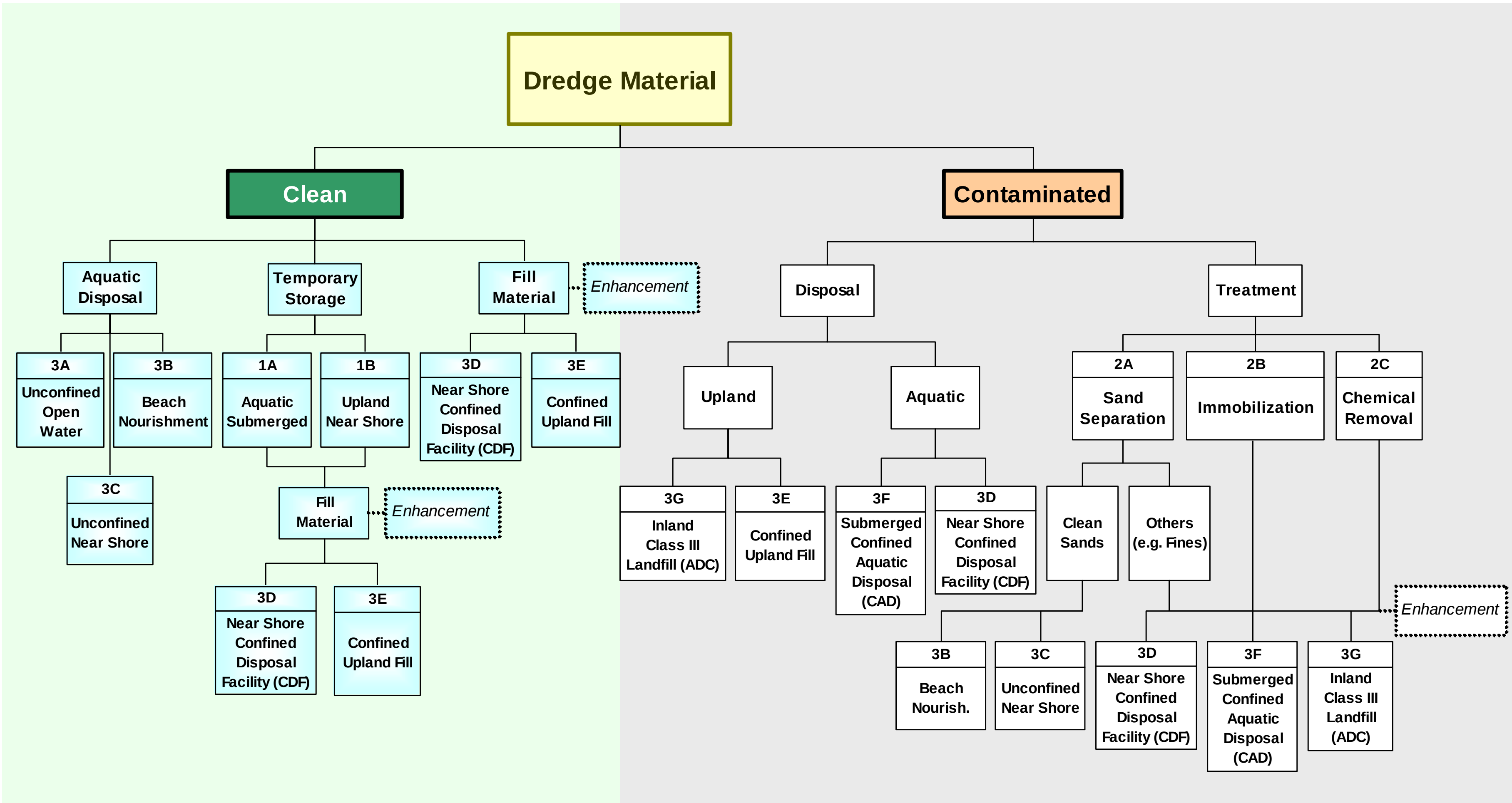

Figure 2.1 DMMP Project Scenario No. 1 (New Work Dredging) – Management Alternatives

Since this project scenario represents typical navigation channel maintenance dredging which includes both clean and contaminated material and a wide range of potential sediment grain sizes, the programmatic EIS will evaluate this scenario against all the management alternatives shown in Figure 1.1. These alternatives (highlighted in "blue") are shown in Figure 2.2.

2.3 PROJECT SCENARIO 3 – BERTH MAINTENANCE DREDGING

This project scenario includes typical Port and Harbor maintenance dredging where sediment that has accumulated along wharf faces is removed to restore navigation depths for ship berthing. Dredge projects are typically small in nature, ranging from a few thousand to less than 100,000 m^3 per event, and the material is dominated by fine-grained materials (approximately 30 to 40 percent sand or less). While these sediments have a fairly low organic material, they are typically mildly chemically impacted (just above ERL screening values and exhibit limited aquatic toxicity). As such, most of the material is not suitable for open water disposal. Current sediment management practices for this material usually includes dewatering it passively and placing it inside new fill sites constructed to support Harbor development projects.

With the high percentage of fines in the dredge material under this scenario, some of the sediment management alternatives (e.g. sand separation) shown in Figure 1.1 will not be suitable for this project scenario. The programmatic EIS will evaluate this project scenario against the alternatives shown in Figure 1.1 that are suitable for this scenario. The appropriate alternatives for Project Scenario 3 are shown in "blue" in Figure 2.3.

2.4 SUMMARY

Three project scenarios (conditions) were developed as representative projects for the region to be evaluated in the programmatic EIS. The programmatic EIS will evaluate each of the three project scenarios and its corresponding management alternatives. Table 2.1 provides a tabular summary of the appropriate management alternatives for each of these project scenarios, which are also presented in Figures 2.1 to 2.3. Descriptions for the management alternatives are provided in Section 3.

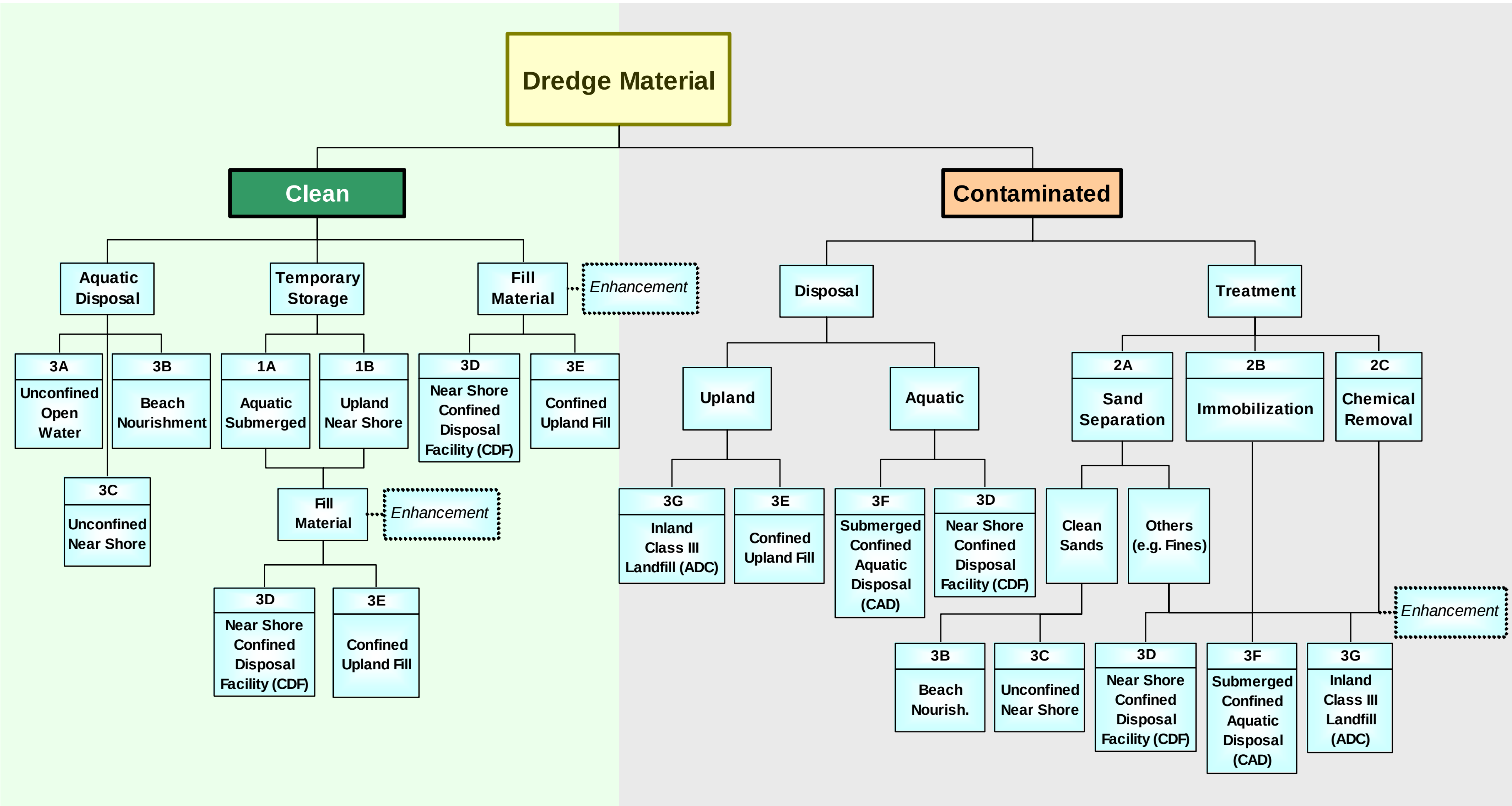

Figure 2.2 DMMP Project Scenario No. 2 (Channel/Harbor Maintenance Dredging) – Management Alternatives

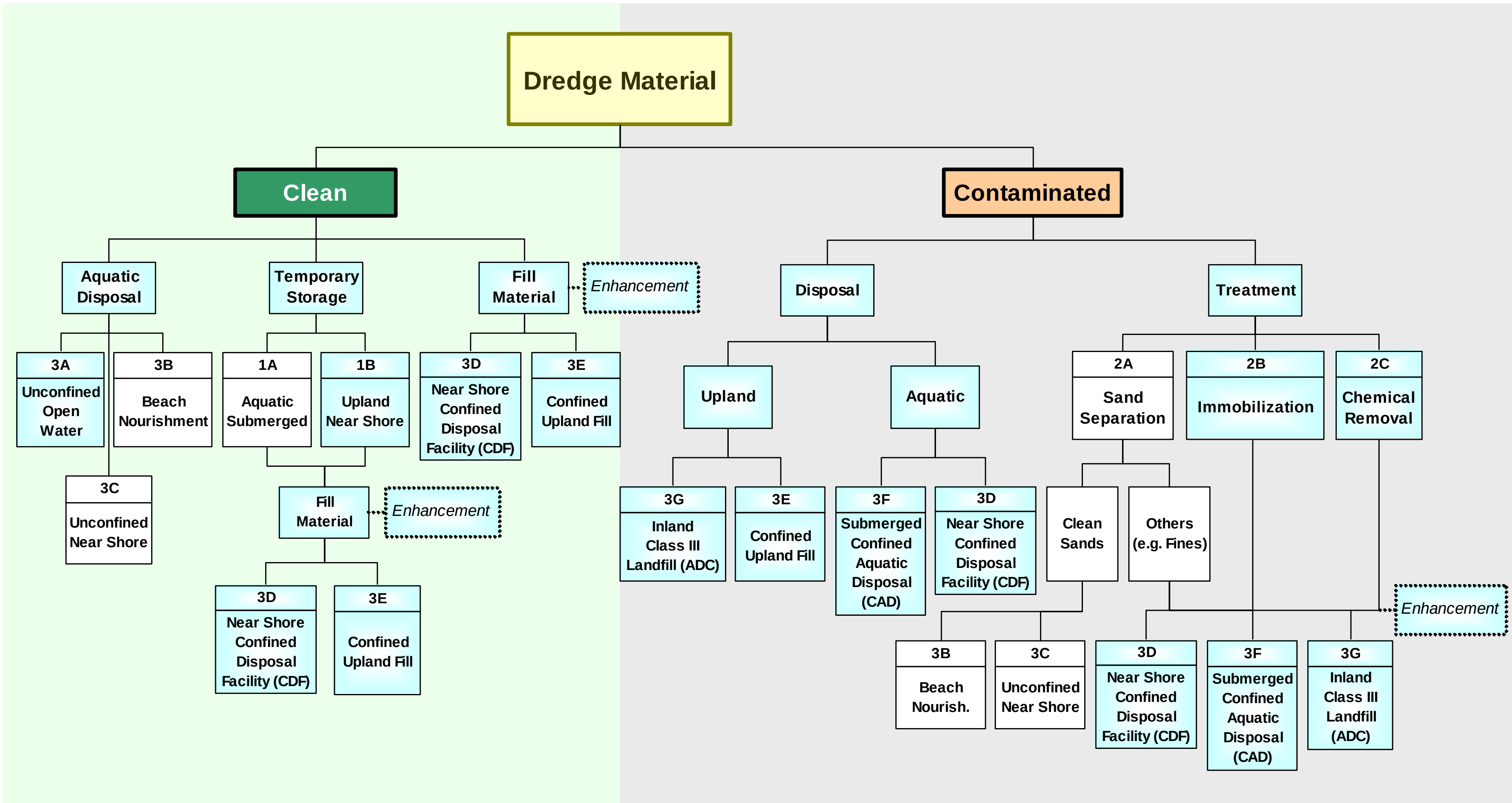

Figure 2.3 DMMP Project Scenario No. 3 (Berth Maintenance Dredging) – Management Alternatives

Table 2.1 DMMP Programmatic EIS Evaluation Framework

ALTERNATIVE	PROJECT SCENARIO #1	PROJECT SCENARIO #2	PROJECT SCENARIO #3
1 – Temporary Storage			
1A – Aquatic Submerged	X	X	
1B – Upland Near Shore	X	X	X
2 – Treatment			
2A – Sand Separation		X	
2B – Immobilization		X	X
2C – Chemical Removal		X	X
3- Disposal			
3A – Unconfined Ocean Disposal	X	X	X
3B – Beach Nourishment	X	X	
3C – Unconfined Near Shore	X	X	
3D – Near Shore Confined Disposal Facility (CDF)		X	X
3E – Confined Upland Fill		X	X
3F – Submerged Confined Aquatic Disposal (CAD)		X	X
3G –Inland (Class III) Landfill		X	X

It is anticipated that the majority of the future dredging and disposal projects in the region will fall under one of these three project scenarios and be represented by the evaluation conducted for the programmatic EIS. It is the goal of the DMMP that these future projects may only require a supplemental environmental evaluation to address potential differences between the proposed project and one of the three scenarios that have already been evaluated by the programmatic EIS. This will result in a significant cost and time savings for future dredging projects in the Los Angeles Region.

3. DESCRIPTION OF MANAGEMENT ALTERNATIVES

This section provides descriptions for the No Action Alternative and the management alternatives shown in Figure 1.1.

3.1 NO ACTION ALTERNATIVE

The No Action alternative permits the existing conditions of the problems associated with the contaminated sediments (lack of readily available disposal alternatives) to persist without a long-term regional management strategy. The No Action Alternative is required under the National Environmental Policy Act (NEPA), and is used as a baseline alternative for the evaluation and comparison of all alternatives developed and described here. Under this scenario, dredging and disposal continue on a project-by-project basis. There will be no readily available, low cost, disposal options for the Corps maintenance dredging at Marina del Rey and Los Angeles River Estuary (LARE) and for the City of Long Beach to dredge its marinas.

Historically, the Port of Los Angeles (POLA) and the Port of Long Beach (POLB) have been able to manage their disposal needs by linking dredging activities with capital improvement projects to provide for dredge material disposal. However, it is anticipated that in the future, the need for dredge material disposal for the two ports will exceed the fill capacity provided for by the capital improvement projects. Hence, under the No Action Alternative, the ports will also be faced with the problem of finding low cost disposal alternatives to maintain their navigation channels and berth areas.

3.2 ALTERNATIVE 1 – TEMPORARY STORAGE

Occasionally, clean dredged sediments may be destined for reuse as future fill material or as feed material for a treatment program not yet fully implemented. In these instances, temporary storage either in aquatic or upland facilities may be a viable option, pending appropriate environmental review. Approximately one percent of the total historical volume generated in the Los Angeles Region has been kept for stock piling at the Ports' storage facilities. Use of these storage facilities allow short-term and long-term storage of dredge material to be beneficially reused later. Two of the primary beneficial reuses practiced in the Los Angeles Region are beach fill and shallow water habitat fill. This alternative is not suitable for the management of contaminated material.

Alternative 1A – Aquatic Submerged Storage

An aquatic submerged storage site in the Los Angeles Region is most commonly a near shore depression. The aquatic submerged stockpiling sites need to be located in sheltered areas with minimum wave energy to ensure stability. The construction of temporary dikes or berms may be needed to help confine the sediment within the stockpiling area. Regulatory agencies would work to generate a Site Maintenance and Monitoring Program (SMMP) to monitor long-term bathymetry of stockpiled materials. Additional requirements would prevent the creation of navigational hazards as a result of the alteration of existing near shore bathymetry, among other aspects.

Given the interaction of unconfined, open-water dredge material with the near shore environment, aquatic stockpiling would be subject to the same regulatory constraints and requirements as for all discharges of dredge material in the near shore, which calls for meeting the requirements of the Inland Testing Manual (ITM). Constraints associated with the short-term impacts due to double handling in the form of placement and re-dredging within a relatively short period of time, and the long-term impacts related to bioavailability would likely limit this option to include only clean sediments that are otherwise suitable for unconfined discharge according to the testing requirements. Current examples of submerged aquatic storage sites in the region include the Western Anchorage site for the Port of Long Beach (POLB); and the Pier 400 Temporary Storage Site for the Port of Los Angeles (POLA). Information for these two sites has been used to form the evaluation assumptions for this project. This alternative provides several opportunities for beneficial reuse of the material because it is essentially storing high quality construction material for future use.

Alternative 1B – Upland Near Shore Storage

An upland temporary storage facility, usually found on port property, is an area of land where dredged sediments can be stockpiled and left in place to passively dewater. The dewatered material is stockpiled until needed. Placement of dredge materials at upland facilities would be subject to the constraints of the Upland Testing Manual (UTM), and other regulatory constraints and requirements that are in place for these facilities, such as the regulation of return water from upland dewatering sites, which is considered a regulated discharge under the Clean Water Act (CWA).

Suitable types of upland stockpiling include placement in existing sediment storage facilities in the Ports and any new storage areas that can be designated for the same purpose on a temporary basis. A current example is the Anchorage Road dredge material holding basin in the POLA, which has received approximately 81,000 m^3 of dredge materials from various berthing basins in Los Angeles Harbor. Information for this site has been used to form the basis of the alternative evaluations for this project.

New stockpiling sites could include confined disposal facilities or new holding basins similar to the existing facilities in the Ports. Given the constraints on land availability and the limited capacities of existing sediment holding facilities, upland storage capacities are expected to be limited in the Region. Logistic arrangement and end-use timelines have to be integrated into storage planning to ensure efficient use and uninterrupted service of existing and new facilities.

3.3 ALTERNATIVE 2 – TREATMENT

"Treatment" refers to a method(s) to decontaminate or sequester contaminants, or enhance previously unsuitable dredge material, to make it more suitable for beneficial reuse. For contaminated sediments, treatment can include one or more processes. Example options include separating the contaminants from the clean portions of the material (sand separation), immobilizing the contaminants (e.g. cement stabilization) so that they cannot readily leach out of the sediments, or removing the contaminants from the whole sediments. Each of the potential treatment options are discussed in the following sections.

Treatment is not generally a management alternative for clean material since more economical alternatives are available. However, some material, even though it is not contaminated, may be too fine grained in nature for use as construction fill material, or contain salts which could leach out of the sediment and impact groundwater resources. In these cases, enhancement of the sediment might be required to increase its geotechnical stability or reduce chloride leaching, both of which may also affect contaminant mobility. Adding cement, for example, will enhance the physical properties of the material in addition to convert contaminants in the material into their least soluble, mobile, or toxic forms. The enhancement of the physical properties of the clean or treated dredge material is not considered as a management alternative for the DMMP. However they will be discussed in Section 3.5 as optional enhancement that may be required for some of the management alternatives. In Figures 2.1 to 2.3, "enhancement" is shown as a dotted box next to the management alternatives that enhancement of the dredged or treated material may be needed.

Alternative 2A – Sand Separation

Sediment is composed of sand and fines. Sand separation is a procedure where, through a series of mechanical processes, sediment particles are separated into sands and finer grained fractions for beneficial reuse. Sand is the most suitable material for construction (regardless of the contaminant level). Fines are primarily silt and clay and are more mobile and adsorb a greater amount of contaminant than sand. Each of these components may be beneficially reused.

Since contaminants are typically bound to the organic layers of fine-grained particles, the first step (sand separation) is usually quite effective in producing a clean sand product, which can then be beneficially reused without further treatment. These beneficial reuses include near shore beach nourishment and unrestricted near shore fill (for habitat or construction use).

Once the sand is separated, the remaining fine-grained particle slurry contains most of the contaminants. The slurry can then be disposed of or it can be subjected to a series of mechanical and chemical processes (e.g., the addition of flocculants) to further separate and concentrate the contaminants, eventually resulting in a manageable waste stream that can be de-watered and disposed of through conventional means. The addition of cement to the fine-grained particles can result in construction-grade fill that can also be used for upland or near shore projects. This material can also be placed in an approved upland landfill. Recent studies to test this process regionally have included a series of laboratory bench scale studies and a field pilot study conducted using dredge material from the LAR. Data from these studies, as well as information from the equipment vendors will be used to evaluate this alternative against the project scenarios.

Alternative 2B – Immobilization

Immobilization technology stabilizes and solidifies contaminated dredge material. The most common technology used to immobilize the contaminants is cement stabilization. This alternative involves stabilization and solidification of contaminated dredge material with cement-based additive mixes to convert contaminants in the material into their least soluble, mobile, or toxic forms and enhances the physical properties of the material. The technology, commonly known as cement stabilization, has been widely used in upland soil remediation projects. Its application to contaminated marine dredge materials, however, has been relatively limited, due partly to the large volumes of the materials involved per project, special material handling requirements, and the physical and chemical characteristics specific to marine sediments.

The cement stabilization process uses select cement-based binders (binders), such as Portland cement, based on their ability to precipitate metal ions, react with specific analytes, and bind/encapsulate specific contaminants. In a typical process, the binder is mechanically blended into the dredge material. The cement reacts with process water and pore water in the dredge material (hydration) to produce a binding gel (e.g. Tobermorite gel). The binding gel coats the contaminated fine particles, cements them into larger clusters, and fills up the micropores in the material's microstructure. The reactions consume water through hydration, produce calcium hydroxide that reacts with siliceous particles to create additional binding gel, and generate heat that accelerates dewatering. Upon adequate curing, the reactions immobilize/encapsulate contaminants in the microstructure of the treated material and enhance the material's engineering properties such as shear strength, compaction, and consolidation characteristics.

The general consensus has been that, for materials predominantly contaminated by organics, cement-based stabilization can be successful only if the target organic contaminants are generally not mobile through air, soil, and water, such as Polychlorinated Biphenyls (PCBs) (Wiles and Barth 1992). The technology is not considered suitable for the treatment of volatile organics and many semivolatile organics (SVOA) due to the normally significant volatilization during the process, although it has been shown that phenols (semi-volatile) can be effectively immobilized in the soil matrix upon treatment (Kolvites and Bishop 1989). Methods that include addition of cementing agents such as modified clays as part of the cement-based binders have indicated potential of success in treating organics (e.g., Sell et al. 1992). A bench study may be required to test the optimal condition (e.g. the percent of cement to be added) in binding the target contaminants of concern.

Alternative 2C – Chemical Removal

Chemical removal can occur using one or more of the following techniques: thermal destruction, chemical treatment, or bioremediation.

Thermal Destruction – The processes include those that heat the sediment several hundreds or thousands of degrees above ambient temperature. These processes are generally the most effective options for destroying organic contaminants, but are also the most expensive. Included in this category are:

- Incineration
- Pyrolysis
- High-pressure oxidation
- Vitrification

Most of the thermal technologies are highly effective in destroying a wide variety of organic compounds, including PCBs, PAHs, chlorinated dioxins and furans, petroleum hydrocarbons, and pesticides. They do not destroy metals, although some technologies (e.g., vitrification) immobilize metals in a glassy matrix. Volatile metals, particularly mercury, will tend to be released into the flue gas. Additional equipment for emission control may be needed to remove these contaminants.

Chemical Treatment – Chemical treatment technologies involve mixing chemical additives with sediments or with sediment slurry. This mixing is typically done in batch operations in some type of process vessel. Chemical treatments may destroy contaminants completely, may alter the form of the contaminants so that they are amenable to other treatments, or may be used to optimize process conditions for other treatment processes. Treated sediments may then be permanently disposed of or put to some beneficial use, depending on the nature and extent of residuals, including reagents and contaminants. Chelation, dechlorination, and oxidation of organic compounds are considered the most promising options.

Bioremediation – Bioremediation is a managed or spontaneous process in which microbiological processes are used to degrade or transform contaminants to less toxic or nontoxic forms, thereby remedying or eliminating environmental contamination. Microorganisms depend on nutrients and carbon to provide the energy needed for their growth and survival. Degradation of natural substances in soils and sediments provides the necessary food for the development of microbial populations in these media. Bioremediation technologies harness these natural processes by promoting the enzymatic production and microbial growth necessary to convert the target contaminants to nontoxic end products. Included in this evaluation are surface bioremediation techniques, in which sediments are removed from the waterway and treated in bioslurry reactors, contained land treatment systems, compost piles, or contained treatment facilities (CTFs).

Other than a passive bioremediation project completed by the POLA, no other local groups has performed dredge material remediation projects using these technologies. As such, no pilot study data is available for use as case examples and the DMMP Programmatic EIS will need to rely on data collected for nationally based projects or from the vendors that offer these treatment services

3.4 ALTERNATIVE 3 – DISPOSAL

"Disposal" refers to management options that rely on discarding the dredge material, usually without the direct intent for providing beneficial reuse or without making any attempt to decontaminate potentially toxic material. However, disposal of clean material on beaches and near shore can provide benefits of widening the receiving beach areas. Disposal options for contaminated material may range from unconfined offshore aquatic disposal, isolation and containment within the aquatic environment, or transport and disposal at an upland landfill facility. Some of these options may also provide secondary benefits such as confined disposal facilities that serve as port expansion projects after completion.

Disposal alternatives evaluated include ocean disposal, beach nourishment, unconfined near shore, confined disposal facility (CDF), confined upland landfill, submerged aquatic disposal, and inland landfill. Each is described in more detail in the following sections.

Alternative 3A – Unconfined Ocean Disposal

The ocean disposal alternative involves placing the dredge material from regional projects at designated open ocean disposal sites, if the material is tested suitable for such disposal.

There are currently two designated open ocean disposal sites within the Los Angeles Region and vicinity: LA-2 located in San Pedro Bay approximately 9.7 kilometers south of the Los Angeles Harbor, and LA-3 off Orange County coast approximately 11.3 kilometers south of Newport Harbor. Over the period of 1976 to 2001, approximately 60 percent of the dredge material from maintenance dredging in the County was disposed of at LA-2. The LA-2 site was designated as a permanent disposal site in 1991 and serves Los Angeles and Long Beach Harbors, LARE, Marina del Rey, Anaheim Bay and Sunset/Huntington Harbor. An Annual disposal volume limitation of 765,000 m^3 (1,000,000 cy) was imposed in 2005. LA-3 was designated as a permanent disposal site in 2005 to service the disposal needs of the Orange County harbors, although record shows that it occasionally received dredge material from maintenance projects in the POLA. An Annual disposal volume limitation of 1,911,000 m^3 (2,500,000 cy) was imposed.

Alternative 3B – Beach Nourishment

Beach nourishment involves placing the dredge material on regional beaches for nourishment. Ideally, the dredged sediment should be composed of grain sizes comparable or slightly larger, as well as aesthetically (color and texture) compatible with the existing beach sediment. For dredge material with different grain size characteristics from the existing beach material, the beach fill will reach a different equilibrium profile compared to the existing beach profile. Coarser material will tend to resist erosion and the new beach profile may become steeper than the original beach. Finer material tends to erode at a faster rate, and may result in a beach with a flatter slope.

The dredge material can be placed directly onto the dry beach either hydraulically via pipeline or mechanically via truck. After placement, the material is typically graded to match the adjacent beach conditions. Direct placement of the dredge material onto the beach will result in the increase in beach width immediately after placement.

This alternative has been historically practiced in the Los Angeles Region. Examples include decades of beach nourishment at Dockweiler Beach with the dredge material from maintenance dredging project in Marina del Rey. Primary consideration for using this alternative at other beach locations in the Region is to avoid selecting receiver areas with significant sensitive marine and biological resources.

Alternative 3C – Unconfined Near Shore

Unconfined near shore beach disposal involves placing the dredge material in the near shore environment for the purpose of restoring regional beaches for recreational use and to protect the shoreline from erosion. Ideally, the dredged sediment should be composed of grain sizes comparable or slightly larger, as well as aesthetically (color and texture) compatible with the existing beach sediment. In this scenario, dredge material is either hydraulically pumped via pipeline or mechanically placed using a dump scow or hopper barge into the near shore environment as a submerged bar parallel to the beach. The placed sediment will gradually move onshore by waves and currents, thereby increasing the beach width. The time it takes to increase the beach width depends on the wave conditions.

This alternative has been historically practiced in Port Hueneme, Ventura, Marina del Rey, and Oceanside harbors. Primary consideration for using this alternative at other beach locations in the Los Angeles Region is to avoid selecting receiver areas with significant sensitive marine and biological resources.

Alternative 3D – Near Shore Confined Disposal Facility (CDF)

A near shore confined disposal facility (CDF) involves placing contaminated dredge materials inside a diked near shore area or island constructed with containment and control measures such as lining, covering and effluent control. Primary issues with near shore CDF disposal include: (1) coastal land availability and costs; (2) wave protection; (3) short-term effects from effluent discharge during and after filling; (4) solids retention during filling; (5) contaminant containment structure design; and (6) long-term end use of the site after closure.

Near shore CDFs constructed with contaminated sediments as fill material have been constructed by the POLA and the POLB for many years and have been the standard method for disposing of contaminated dredge sediments. To construct a CDF, dikes would be constructed across the entrance to the slip or around the perimeter of the disposal area with open areas to allow barge traffic. Sediments would then placed into the fill area, initially via bottom dump barge and then hydraulically as the fill area became too shallow to allow access via barge. As the sediment accumulated in the fill area, the dike walls would be increased in height until they broke the surface of the water. Weirs would then used to drain the remaining water from the fill area. After dewatering, the fill areas would be covered with asphalt and developed to support various port facilities.

Alternative 3E – Confined Upland Fill Site

The upland disposal alternative involves placing dredge material in an upland facility constructed with containment measures such as lining, diking, and covering. Typical upland disposal facilities include upland CDF and commercial landfills. An upland CDF is operated similar to a near shore CDF, except that it is constructed entirely inland. Sediments would be transported to the facility either via truck, rail or hydraulically pumped into the containment area, if the landfill was located closer to the dredge site. The material would be dewatered and then either reused or capped with clean soils. A clay base or synthetic liner may be required to prevent seepage of water from the CDF into the underlying groundwater. Decant water leaving the facility would be typically treated to remove solids or contaminants and then discharged back to the dredge location via pipeline. The primary issues with upland

CDF include: (1) land availability and cost for the facility; (2) contaminant leaching; (3) effluent control, solids retention and surface runoff control; and (4) the long-term end use of the site after closure.

Alternative 3F – Submerged Confined Aquatic Disposal (CAD)

Confined aquatic disposal (CAD) is a procedure where contaminated sediments are typically placed into a submerged depression or pit and covered with clean sediments to form a cap that will prevent upward migration of contaminants into the water column or surficial sediment layer. Occasionally, sediments will simply be mounded and capped rather than placed in a depression. This alternative relies on standard dredging equipment such as bottom dump scows. Dredge material placement and cap construction would be designed to prevent uneven placement and smooth surface areas.

In early 2001, the Los Angeles District of the U.S. Army Corps of Engineers (USACE) initiated the Los Angeles County Region Dredge material Management Plan Pilot Studies (USACE 2002a) to evaluate the feasibility of four alternatives for treating and/or disposing of contaminated dredged sediments originating from within Los Angeles County. Four alternatives were evaluated, including aquatic capping/confined aquatic disposal (CAD).

For the aquatic capping study, 105,000 cubic meters of contaminated sediment were mechanically dredged from the mouth of the Los Angeles River Estuary (LARE) in the City of Long Beach and placed using split hull barges into the North Energy Island Borrow Pit (NEIBP) - an existing pit located in the inner harbor off the coast of Long Beach. The contaminated sediment, which contained elevated concentrations of metals and PAHs, was subsequently capped with a one meter layer of clean sand dredged from a temporary storage pit. Water quality monitoring was conducted during all phases of construction to evaluate potential environmental impacts.

Following construction, the CAD site was monitored for three years to evaluate long-term cap stability, containment/isolation of the contaminated sediments, and biological re-colonization of the cap surface. Three years of intensive monitoring has shown that the cap has maintained its structural integrity. There has been no measurable erosion of cap material or fissures visible in the cap surface; rather an accumulation of newly deposited material is now present suggesting a rapid depositional process is at work. Chemical containment has also been maintained. Elevated concentrations of contaminants were never detected in overlying cap material or in the cap pore water suggesting that contaminant migration is not occurring. Biological re-colonization of the cap has been rapid during the first two years of monitoring and was maintained in Year 3. The extensive data collected from this pilot study will be used to evaluate the project scenarios for the programmatic EIS.

Alternative 3G – Inland (Class III) Landfill

Commercial landfills can potentially receive dredge material if it is delivered in the proper state (material and water content). Since most landfills in the County (Class III) have limited capacities, potentially suitable facilities are all located outside the Los Angeles Region in other counties as well as Arizona and Utah. The primary issues with placing large quantities of dredge material in such landfills include: (1) dewatering requirement; (2) contaminant and chloride leaching; (3) availability of suitable existing landfills; (4) land availability and cost for new landfill facilities; (5) land availability and cost for dewatering facilities; and (6) transportation cost.

3.5 DREDGE MATERIAL ENHANCEMENT (IF NEEDED)

As mentioned earlier, enhancement of clean or contaminated dredge material may be required to improve the physical properties of the material to make it more suitable for some of the management alternatives (e.g. Alts. 3D, 3E, 3F and 3G) included in the DMMP. Dredge material enhancement can be as simple as passive dewatering and/or adding cement for material that is very fine and slurry (e.g. the fines coming out of the sand separation alternative (Alt. 2A), or can be more involved such as sediment washing and sediment blending.

Sediment washing as a technology for contaminated sediments typically refers to a process that involves creating a slurry by combining the contaminated dredge material with fresh water. The slurry is then subjected to physical collision, shearing, and abrasive actions and to aeration, cavitation, and oxidation processes while reacting with chemical additives such as chelating agents, surfactants, and peroxides. In doing so, the contaminants are transferred from the sediments to the water phase in the process. The washed material is then dewatered using hydrocyclones and centrifuges or by settling to a point where 70 to 80 percent of the solids remain. The process water containing the contaminants is collected and treated, and the washed material may be beneficially reused. Primary issues of concern associated with the traditional sediment washing process include treatment requirements for the residual effluent water, and the end use of the dewatered fine material cake (a primary product if the dredge material consists predominantly of silt and clay).

The sediment washing enhancement approach considered for the DMMP focuses on salt, and not chemical removal from the sediments, so that the material can be beneficially reused as daily landfill cover or roadway sub-base grade fill without jeopardizing underlying groundwater reserves. A pilot laboratory study was conducted using material dredged from the LARE to evaluate the effectiveness of sediment washing for removing chlorides and sodium from marine sediments (USACE 2002b). Two test methodologies were evaluated to simulate potential field applications for regional dredging projects: active and passive washing techniques. Active (mechanical) washing was simulated in the laboratory by using a pressure filter to dewater the sediments and deionized water to wash salts from the dewatered sediment cake. Passive (gravity drainage) washing was simulated in the laboratory using a column leaching apparatus that diluted and removed the salts from the sediment cake. Results of the pilot study also showed that sediment washing was effective at removing chloride and sodium from the dredged sediments using either laboratory approach. Chemical constituents (e.g., metals) were not significantly reduced.

Sediment blending can be used to enhance the physical properties of the dredge material by blending the fine-grained material with borrowed clean sand material to create an aggregate that exhibits enhanced engineering properties and reduced apparent contamination levels. One of the primary issues of concern with sediment blending is the cost of obtaining large quantities of the clean sand required to achieve the treatment objective. Other issues include: (1) the availability of borrow materials; (2) costs associated with large-volume material handling; (3) the methods used to achieve the specified level of blending; (4) land availability for the blending facility; and (5) cost for dewatering. Also of concern are the environmental acceptability and the engineering properties of the material after blending.

The regional user's surveys conducted in conjunction with a literature review (USACE 2002c), suggested that no contractors are currently blending fine-grained dredged sediments with additives to increase the structural properties of the sediments (for use as fill), largely because of the costs associated with the process. Instead, the fine-grained sediments are either placed in layers or placed in less (structurally) critical locations within the landfills.

4. References

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