LOS CERRITOS WETLANDS CONCEPTUAL RESTORATION PLAN

SOIL MANAGEMENT REPORT

Prepared for:

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1. INTRODUCTION

1.1 BACKGROUND

The Los Cerritos Wetlands Conceptual Restoration Plan is being conducted for the Los Cerritos Wetlands Authority (LCWA) to identify feasible, cost-effective, and ecologically beneficial restoration alternatives for the Los Cerritos Wetlands (LCW) Complex. The potential wetlands area consisting of multiple parcels is comprised of approximately 500 acres for potential wetlands restoration located adjacent to the historical Los Cerritos Wetlands and San Gabriel River Estuary (Figure 1.1). A conceptual restoration plan is being developed. This site is shown in Figure 1.1 as Base Project Properties.

1.2 PURPOSE AND SCOPE OF WORK

The work for Task 6 of the Los Cerritos Wetlands Conceptual Restoration Plan is to evaluate potential disposal and beneficial use options for excavated and/or dredged material associated with restoration and enhancement activities. The work performed included:

- Review soil investigation report prepared by Kinnetic Laboratories, Inc. under Task 5
- Evaluate soil characteristics for re-use and disposal options
- Develop sediment management or disposal options
- Develop unit cost of sediment management or disposal options
- Provide recommendations and identify future steps

While the soil investigation conducted by Kinnetic Laboratories under Task 5 addressed only soil conditions of the base plan, the soil management options discussed in this (Task 6) Soil Management Report are applicable to the entire LCW complex.

Source: Moffatt & Nichol

Figure 1.1 Los Cerritos Wetlands Complex

2. EXISTING SOIL CHARACTERISTICS

2.1 BACKGROUND

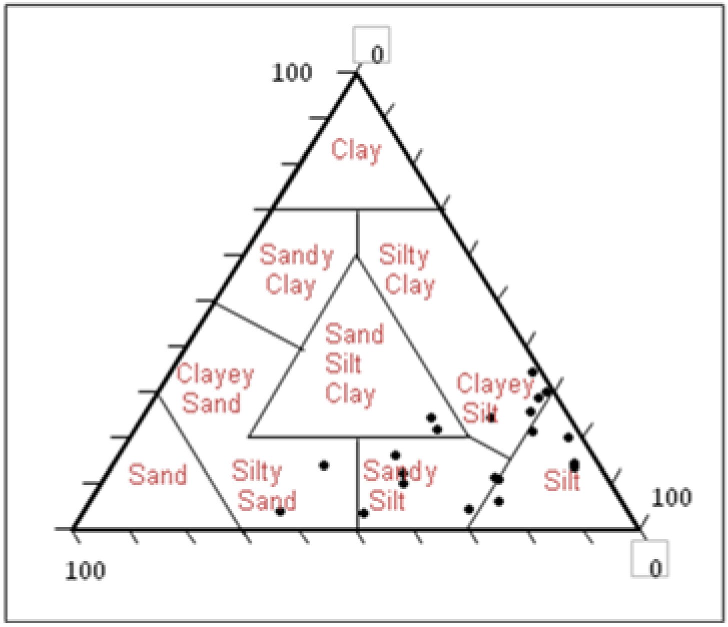
The Los Cerritos Wetlands complex has been used for oil exploration and recovery for the past 90 years. Waste products from drilling operations were stored in sumps located throughout the property. In addition, some areas were used as landfill for disposal of clean construction materials. Other areas were used as disposal sites for dredged material excavated during the construction of the cooling water intake channel for the Haynes Power Plant. These activities have altered the native soil at the surface and adversely impacted the quality of soils in the property.

2.2 SOIL INVESTIGATIONS

Under Task 5 of this current project, a review of all available Phase I and Phase II environmental site assessments for the base project (LCWA and City of Long Beach) parcels was conducted. Existing available data were summarized and potential data gaps were identified. Information on levels of contamination was summarized and discussed in the "Soil Contamination and Grain Size Characteristics Report" (Soil Report) (Kinnetic 2012). In addition, the report also summarizes the grain size characteristics based on information from existing data, and five soil cores taken in the LCWA Phase I (Bryant) parcel. The following sections discuss the soil grain size and contamination characteristics. More details about the soil characteristics can be found in the Soil Report.

2.3 SOIL GRAIN SIZE DISTRIBUTION

The five soil cores taken in the LCWA Phase I (Bryant) parcel for the current project were 10 to 11.5 foot deep. Three to five soil samples were taken from each core to obtain quantitative grain size information. Figure 2.1 is a Sheppard sand-silt-clay plot of these samples. It can be seen that most of the samples are silts, sandy silts, and clayey silts. Based on the information on the particle size distributions of the samples (presented in Table 12 of the Soil Report), the silt content was over 50% in most samples. Samples from Core D, which was at the northwest corner of the parcel, contained 37% to 61% sand in three of the four samples. Sand content in other samples for Cores A, B, C and E ranged from 3% to 30%, with 9 of the 17 samples containing over 20% sand.



Source: Kinnetic 2012

Figure 2.1 Sheppard Sand-Silt-Clay Plot of LCWA Phase I (Bryant) Parcel

Information on soil grain size from existing data is limited with most data being visual characterization or texture descriptions of surface soils. The Soil Report indicated that the entire area has been subjected to some degree of fill.

The Jurisdictional Wetland Determination conducted for the Marketplace Marsh provided visual characterization of soil texture of the top 20 inches of soil. Many of the sample locations showed evidence of fill materials such as compacted gravels, with the overall characteristics being clay-loams, loams and sandy loams.

Three soil cores were taken from the Phase I (Bryant) parcel in 2009 by NRCS. These cores provided quantitative grain size characteristics of the top 2 meters (6.5 feet) of soil. These soil profiles showed varying grain size characteristics. Overall, sand content in the samples taken at different depths of the three cores ranged from 10% to 80%. In one core, sand content was high (70% - 80%) in the top 1.2 meters (3.9 feet).

Core logs associated with sampling conducted in the Hellman Ranch parcel indicated that soils are predominately silts and silt-clays with some layers of clay at depth and some sands near the surface.

The Geotechnical Investigation Report for Hellman Ranch Tank Farm Replacement Project (Geomatrix 2006) provided additional soil characteristics information. The Hellman Ranch Tank Farm is outside the base project area (LCWA and City of Long Beach) and; therefore, not included in the Soil Evaluation for Task 5. For the Tank Farm Replacement Project, soil cores were taken to a depth of more than 60 feet below surface. The core logs show that the top 10 feet to 15 feet of soil was characterized by silts and clays. Below this depth, silty or poorly graded sand was found in most cores.

2.4 SOIL CONTAMINATION

Under Task 5 of this project, the previous soil investigations were reviewed to identify and summarize information on soil contamination in the base project area. The compounds identified and reported in previous soil investigations included total recoverable petroleum hydrocarbons / total petroleum hydrocarbons (TRPH/TPH), metals, polycyclic aromatic hydrocarbons (PAHs), and organochlorine pesticides. Prior investigation reports did not provide information on polychlorinated biphenyls (PCBs), suggesting that these compounds were not expected to have been used and therefore not tested for.

2.4.1 TRPH/TPH

Testing for TRPH/TPH was reported in soil investigations for the LCWA Phase I (Previously Bryant) parcel and LCWA Phase 2 (Hellman Ranch) parcel. TPH concentrations were highest in sumps and in the vicinity of historical tank farms, but were widespread where these contaminants were measured. The levels of TPH detected in many of these past investigations were above the California Environmental Screening Level (ESL 2005) for TPH in soil for areas for residential use.

2.4.2 Metals

Metals have not been the focus of prior soil investigations for the City of Long Beach and the LCWA Phase I (Previously Bryant) parcels. In the LCWA Phase I Separate Parcel and the LCWA Phase II (Hellman Ranch) parcels, metals were generally within the range of typical background concentrations, although elevated concentrations, particularly lead, arsenic, vanadium, barium and chromium, were reported to be associated with high concentrations of TPH, in the sumps and were associated with some drilling muds. The concentrations of these samples were above the NOAA Ecological Effects Range Low (ERLs), suggesting that the soil would not be suitable for aquatic habitat without remediation. Extremely high concentrations of metals were reported at a limited number of sites. Sampling densities were not sufficient to identify distinct patterns of association with any particular feature or location.

2.4.3 Organochlorine Pesticides

Organochlorine pesticides concentrations were reported in the soil investigations for the LCWA Phase I (OTD/Edison) parcel and the LCWA Phase II (Hellman Ranch) parcel. Large numbers of analyses have not been conducted, but results from prior investigations indicated that these compounds tend to be present in surface soils.

In the LCWA Phase II (Hellman Ranch) parcel, elevated concentrations of DDT, DDE, chlordane and dieldrin were found in surface soils along an access road but not commonly in the sumps.

For the OTD/Edison parcel, prior investigations for organochlorine pesticides used reporting limits well above the NOAA ERL values because they were based on human criteria consistent with other Phase I and Phase II Environmental Site Assessments. Therefore, any measureable concentrations of these compounds would readily exceed the ERLs and would not be useful for evaluation screening for wetland habitat. There were two locations with very high levels of DDE, DDT, chlordane and dieldrin concentrations on the OTD/Edison parcel, at levels well above NOAA ERM values. These values were found mainly in the surface soil samples, below which the pesticide concentrations reduced significantly.

2.5 SUMMARY OF SOIL CHARACTERISTICS

The soil properties of the project site as provided in the Soil Report can be summarized as follows for the purpose of soil management consideration.

- Presence of non-native fill.
- Variable grain size distribution in soil samples. Sand content in some samples was as high as 70%.
- Contaminated soils were found, especially in the sump areas. Contaminants included petroleum hydrocarbons and metals.
- Pesticides were found, mostly concentrated on the surface soils.
- Metals concentrations mostly within the range of background concentrations, except in the sump areas.

It was noted in the Soil report that additional data and soil investigations would be needed. The soil management options considered in this report are based on the soil data currently available, so the soil management strategies may have to be re-assessed when additional soil data become available.

3. RESTORATION EARTHWORK

It is expected that the wetland restoration will consist of several typical features common to all alternatives, such as intertidal, subtidal and upland habitat areas. The restoration process will involve modifying and regrading the existing topography and landforms. The development of soil management options will be based on the consideration of these restoration features.

3.1 EXISTING TOPOGRAPHY AND LANDFORMS

The existing ground elevations throughout the site are mostly within the ground elevation range of coastal wetlands habitat within southern California. The majority of the area northwest of the San Gabriel River consists of ground that would support high marsh and marsh plain with some mudflat and open water habitat. The majority of area southeast of the San Gabriel River consists of ground that would support high marsh, transition, and upland habitats. This implies that only a relatively small amount of earthwork would be needed to restore the site to coastal wetlands habitat.

Some existing features would pose challenges to the restoration process. Existing levees are found along the banks of the San Gabriel River and Haynes Cooling Channel. The excavated materials from the construction of San Gabriel River channel and the Haynes Cooling Channel filled the adjacent wetland areas and raised the ground elevations. The historical oil exploration and production facilities have created extensive non-natural topography consisting of roads, berms, basins, and drainage channels. These existing features might have to be modified for wetland restoration.

3.2 WETLAND RESTORATION FORMATION

3.2.1 Intertidal and Subtidal Habitat Areas

Some areas of the LCW complex would likely be lowered and restored to intertidal and subtidal wetland habitat areas. To connect the restored wetland to the ocean water, tidal channels would be excavated/dredged. The soil excavated from these areas would be placed either on site upland or disposed of off-site. The surface soil of the restored area would have to be suitable for aquatic habitat. Unsuitable soil would have to be removed or treated.

3.2.2 Upland

Upland restoration will include restoring and enhancing existing upland, as well as constructing additional upland areas for upland habitat. Besides providing an ecologically balanced habitat distribution, the creation of upland habitat might also provide an on-site fill area for excavated material, thus reducing the need for off-site soil disposal. The upland soil receptors would be terrestrial and more tolerant than those for the intertidal and subtidal habitat areas.

3.2.3 Levees, Berms and Service Roads

The existing levees found along the San Gabriel River Channel and Haynes Cooling Channel protect the adjacent land from flooding during heavy storms and fix the position of the channels. Levees will also be needed in the restored wetland for the same purpose. The existing levees may be relocated, improved, and/or modified to accommodate the new hydrologic system of the restored wetland. In addition, berms would be installed to create flow boundaries where necessary. Berms may also provide service roads for maintenance and monitoring purposes. These levees and berms would generally be constructed with compacted fill. The soil receptors of these features will be the most tolerant among all the restoration components.

3.2.4 Non-developed Areas

Some areas in the LCW parcels may be left unmodified for the proposed LCW restoration. The surface soil of these areas should, nevertheless, be consistent with the overall restoration goal. If contaminants exist in these areas, they may have to be isolated, treated and/or removed.

4. SOIL MANAGEMENT AND DISPOSAL OPTIONS

The type of materials in the LCW base project site to be considered for disposal or beneficial use include clean soil excavated/dredged from existing tidal wetland and upland areas, construction debris, and contaminated soil and materials. The soil grain size composition consists primarily of silts, sandy silts, and clayey silts. A range of soil management (i.e. reuse/disposal) options were developed to process these materials based on soil characteristics information from the Soil Report, information on opportunities for disposal and beneficial use available in the region, and the sediment management scenarios designed and/or implemented for similar projects with southern California (e.g., Batiguitos Lagoon, Agua Hedionda Lagoon, San Dieguito Lagoon, Bolsa Chica Wetlands, and Buena Vista Lagoon). The soil management options are grouped into two categories: no-treatment options and with-treatment options. These options are described below.

4.1 NO-TREATMENT SOIL MANAGEMENT OPTIONS

The no-treatment soil management options are discussed in this section. These options would be feasible for handling clean material, as well as material with low levels of contamination. Both on-site reuse and off-site disposal options are available for consideration.

On-site No-treatment Options

- Upland, levees and berms
- Wetland cover
- Encapsulation

Off-site No-treatment Options

- Ocean Dredged Material Disposal Site
- Separate sand for off-site beach fill
- Construction fill
- Class III landfill
- Class I disposal facility

4.1.1 On-site No-Treatment Soil Management Options

Upland, Bird Nesting Sites, Levees and Berms

Excavated material from cut areas would be loaded on dump trucks and transported for on-site upland, bird nesting sites, levee or berm construction. Depending on the water content of the fill, dewatering may be necessary. The fill materials would be spread, graded and compacted as needed. Materials for placement on levees and berms would have to meet specific grain size distribution requirements. In terms of soil contamination level, traces of contamination in levee or berm materials would likely be acceptable, especially for the layers underneath the exposed surfaces. On the other hand, the grain size distribution requirement for upland fill and nesting sites would be less stringent, but the contamination levels acceptable for upland and nesting site fill material would likely be lower than those of berm and levee materials. The ecological risk of reusing on-site material for the targeted wildlife/vegetation should be assessed in the future.

Wetland Cover

This sediment management option involves the placement of excavated material from cut areas on on-site wetland areas. Materials would be transported by loader and dump trucks. The fill materials would be spread, graded, and compacted as needed. This option is suitable for filling or backfilling restored wetland areas where existing ground elevation is lower than the proposed wetland elevation or where the grain size characteristics and/or contamination levels of the original material are not suitable for wetland habitats.

Encapsulation

Encapsulation can be used for material that is relatively clean such that it can remain on-site and be covered with a layer of clean soil. The level of contamination acceptable for the specific receptors at the encapsulation site, as well as the need for a filter layer would have to be assessed further. The contaminated material may be covered in place, or encapsulated at a new location in the project site to suit the grading of the restoration plan. The cost of this option would be the typical earthwork operation cost of excavation, transportation, spreading, grading and compaction of material. It may also include the cost of filter installation.

4.1.2 Off-site No-Treatment Soil Management Options

Ocean Dredged Material Disposal Site

Current regulations allow ocean disposal of clean material dredged from the Waters of the United States. This option would be feasible for disposing of clean material dredged from existing tidal wetlands. The nearest EPA-approved ocean dredged material disposal site (ODMDS) to LCW is the LA-2 ODMDS. The disposal cost for this option includes dredging, hauling, and disposal at the LA-2 ODMDS, which is located about 12 miles southwest from the San Gabriel River estuary. The transportation and disposal cost would be about $7 per cy. Other costs would include excavation/dredging, loading, testing and permitting.

Separate Sand for Beach Fill or Nearshore Placement

Generally, sediment for beach nourishment purposes should be clean with a high percentage of sand of greater than 0.075 millimeters in size. In addition, the sediment should be similar to the material already present at the receiver beach. For nearshore placement (e.g., greater than 30 feet deep) excavated soils should be 60 percent or more sand. The higher sand content found in some areas warrant this option to be taken into consideration, although more grain size characterization would have to be conducted in future for the proposed cut areas in order to further assess the feasibility of this option. There is also the option of separating the sand from finer-grained particles as well as contaminants through recently advanced sand separation technologies. The LCW is within a short distance from many beaches, therefore the hauling cost would be relatively inexpensive. For sandy materials, the cost of disposal would include testing, excavation, loading and unloading, transportation, spreading and grading. For lower sand content material, the additional cost would be that for the sand separation process, which is about $25 per cy for clean material (USACE 2002); as well as the cost of disposing of the finer materials.

Construction Fill

This option involves hauling the excavated material off-site to construction sites. Suitable material can be beneficially re-used for road beds, grading backfill, or for port development projects (e.g., pier landfill) at the Port of Long Beach, Port of Los Angeles, or U.S. Navy facility at Anaheim Bay. The availability of these disposal sites and the associated unit cost depends heavily on the timing of project construction. The cost of disposal is mainly associated with excavation, transportation, loading, unloading and testing of the material. The estimated unit cost to dispose of “clean” soil at the Port of Long Beach is about $20 per cy.

Class III Landfill

If the material is clean, it can be disposed of in a Class III landfill either as daily cover or as waste. The cost for disposal as daily cover would be much cheaper than disposal as waste. However, the need for daily cover by the landfills could be limited and would most likely not be a viable option for a large quantity of material. This option could also be considered for disposing of construction debris. The disposal cost as waste, which includes transportation and a disposal fee, would be about $50 per ton (Clean Harbors, 2012). Some of the landfills that would accept soil and construction debris include Puente Hills Landfill in Whittier, Scholl Canyon Landfill in Glendale, Calabasas Landfill in Agoura, Chiquita Canyon Landfill in Castaic in Los Angeles County, and Olinda Alpha Sanitary Landfill and Frank R. Bowerman Sanitary Landfill in Orange County.

Class I Disposal Facility

This option would be suitable for metal bearing waste failing federal and state hazardous restriction tests that is suitable for landfill disposal. The contaminated soil would be excavated and hauled to one of the two Class I disposal facilities: the Clear Harbors Buttonwillow, LLC. in Buttonwillow, California (160 miles from LCW) or the Chemical Waste Management's Kettleman Hills Facility in Kettleman City, California (200 miles from LCW). The cost of direct placement in a Class I landfill would include transportation and a disposal fee. The disposal fee at Buttonwillow is $55 per ton for non-RCRA, and $62 per ton for RCRA (Clean Harbors 2012). The transportation fee to Buttonwillow is $53 per ton. It is assumed that the California State Board of Equalization (BOE) tax is exempted for this project, as the BOE tax does not apply to hazardous waste that result when a government agency removes or remedies a release of hazardous waste in the state caused by another person (H&SC Section 25174.1). The BOE fee, if required, would be $5.72 per ton for non-RCRA waste or $51.30 per ton for RCRA waste. Therefore, the total cost of direct placement in Buttonwillow would be about $108 per ton ($77 per cy) for non-RCRA soil/debris and $115 per ton ($82 per cy) for RCRA soil/debris.

4.2 WITH-TREATMENT SOIL MANAGEMENT OPTIONS

The with-treatment soil management options are listed below. These options would be used mainly for contaminated material. Similar to the no-treatment category, there are both on-site reuse and off-site disposal options for the with-treatment management options.

On-site With-treatment Options

- Stabilization Treatment for Upland, Levees and Berms Disposal
- Bioremediation for Upland, Levees and Berms Disposal

Off-site With-treatment Options

- Thermal Treatment/Recycling for Class II Facility Disposal
- Stabilization for Class I Facility Disposal
- Incineration for Class I Facility Disposal

4.2.1 On-site With-Treatment Soil Management Options

Stabilization Treatment for Upland, Levees and Berms Disposal

Stabilization treatment involves mixing the contaminated soil with cement-based additives, such as Portland cement, lime, fly ash and kiln dust, to chemically bind the contaminants through a dynamic exothermic reaction (M&N 2007). This process could be used to treat both metals and organic contaminants. The stabilization process would also produce material suitable for levees and berms construction. Pilot studies performed in 2001 for the Los Angeles Contaminated Sediments Task Force (USACE 2001) showed that the process would cost $30 per cy. If adjusted for inflation, the 2012 unit cost would be about $45 per cy. Additional cost would include general earthwork operation cost, including excavation, transportation, stockpiling, backfilling and compaction.

Bioremediation for Upland, Levees and Berms Disposal

Bioremediation involves injecting soils with naturally occurring microbes and chemicals to stimulate the biological degradation of organic contaminants. It is suitable for treating PAH-impacted soils, but not effective for metals. Commercially available technology would take about eight months to complete and would cost about $60 to $90 per cy (M&N 2007). The treated material could be reused on-site for upland, levees and berms construction. Additional cost would include excavation, transportation, stockpiling, backfilling and compaction costs.

4.2.2 Off-site With-Treatment Soil Management Options

Thermal Treatment/Recycling for Class II Facility Disposal

This option would be limited to soil containing total petroleum hydrocarbons and non-hazardous metals, VOCs, and SVOCs. The contaminated soil would be hauled to TPS Technologies, Inc. in Adelanto, California, which is a Class II Facility. The soil would be treated using thermal treatment/recycling. The cost for transportation, treatment, and disposal would be about $60 per ton (about $43 per cy).

Stabilization for Class I Facility Disposal

This option would be used for metal bearing waste failing federal hazardous restriction tests that is not suitable for landfill disposal. The contaminated soil would be excavated and hauled to one of the two Class I disposal facilities: the Clear Harbors Buttonwillow, LLC. in Buttonwillow, California (160 miles from LCW) or the Chemical Waste Management's Kettleman Hills Facility in Kettleman City, California (200 miles from LCW). The soil would be remediated by contaminant stabilization followed by direct placement in a landfill. Based on prior soil investigations, the on-site soil would likely not fall under this category. The cost of stabilization at Buttonwillow would be $174 per ton, transportation cost would be $53 per ton, such that the total cost for this option would be $227 per ton (about $162 per cy) (Clean Harbors 2012). The BOE tax, if required, would be $20.71 per ton.

Incineration for Class I Facility Disposal

This option would be used for metal bearing or organic bearing waste that is not suitable for landfill disposal. The contaminated soil would be excavated and hauled to Clean Harbors in Aragonite, Utah. This soil would be remediated by incineration followed by direct placement in a landfill. Based on prior soil investigations, the on-site soil would likely not fall under this category. The cost for treatment and disposal would range from $0.45 to $0.61 per pound (Clean Harbors 2012), and the transportation cost would be $100 per ton. The total cost for this option would range from about $1,000 to $1350 per ton (about $720 to $970 per cy).

4.3 OPTION SELECTIONS

The on-site soils as reported in prior investigations exhibit a wide range of characteristics. Depending on the properties of the targeted soils, the soil management options available would be different. Table 4.1 presents the possible soil management options available for different types of material. Based on past land use and the results of prior soil/sediment characterization, it is assumed that there are no RCRA-hazardous soils in the project site. Therefore the options of off-site stabilization for disposal in Class I facility and incineration for disposal in Class I facility are not selected for any material type. It is anticipated that a combination of soil management options will be employed for the restoration plan. A range of disposal option scenarios could be developed for the restoration alternatives based on the information from this report.

Table 4.1 Los Cerritos Wetland Restoration Soil Management Options

Material Type	No-Treatment								With-Treatment		
	On-site			Off-site					On-site		Off-site
	Upland, Levees and Berms	Wetland Cover	Encapsulation	Ocean Dredged Material Disposal Site	Separate Sand for off-site Beach Fill	Construction Fill	Landfill (Class III)	Class I Disposal Facility	Stabilization for On-site Upland, Levees and Berms	Bioremediation for On-site Upland, Levees and Berms	Thermal Treatment/ Recycling for Disposal in Class II Facility
Clean Soil in Existing Tidal Wetland											
Silty Sand	x	x		x	x	x	x				
Silt and Clay	x	x		x	?	?	x				
Clean Soil in Existing Upland											
Silty Sand	x	x			x	x	x				
Silt and Clay	x	x			?	?	x				
Debris											
Non-contaminated Debris	?					?	x				
Contaminated Debris								x			x
Contaminated Soil											
Non-hazardous	?	?	x	?	?	?	?		x	x	x
Non-RCRA			?					x		?	?

Legend

x	Feasible option
?	Questionable option
(shaded box)	Infeasible option due to economics and/or regulations

5. SUMMARY

The Los Cerritos Wetland complex has been used for oil exploration and recovery in the past century. In addition, some areas have been used as disposal site for excavated material during the construction of the San Gabriel River channel and Haynes Cooling Channel. These land uses have altered the natural soil characteristics and caused some soils to be unsuitable for wetland receptors.

Restoring the site to wetland habitat would involve a series of earthwork activities: excavation to create tidal and subtidal ponds and channels, providing suitable wetland cover for target habitat, filling and grading areas for upland development, modifying and constructing berms and levees for flood control and wetland hydraulic system, and protecting existing infrastructure in place where necessary.

The presence of unsuitable material for wetland habitat, as well as the anticipated earthwork activities would require soil management strategies to handle the excavated material. Options to beneficially reuse and/or disposal have been identified in this report. These options were derived based on the available soil data, information from other wetland restoration projects in southern California, and disposal opportunities available in the region. The soil management options can be grouped into two categories: “no-treatment”, and “with-treatment”. Some of the options are designed for on-site disposal or reuse, others are for off-site disposal or reuse.

The no-treatment options for on-site reuse include upland, levees and berms placement, wetland cover placement, and encapsulation. The no-treatment options for off-site disposal include ocean dredged material disposal site, sand separation for beach-fill and nearshore disposal, construction fill, Class III landfill, and Class I facility disposal.

The with-treatment options would be used to handle contaminated material unsuitable for wetland habitats. The on-site options include stabilization for reuse on upland, berms and levees, bioremediation for reuse on upland, berms and levees, and thermal treatment for disposal in a Class II facility. There are two other options for RCRA-hazardous materials, which can be considered in the future if such material is identified.

Information of the soil management options and associated costs would be helpful when estimating construction costs of various alternatives. It is anticipated that a combination of disposal and reuse options would be considered for the restoration alternatives.

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