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**ENVIRONMENTAL PROTOCOL:  
MIDDLE HARBOR REDEVELOPMENT  
SEDIMENT MANAGEMENT**

Port of Long Beach  
Environmental Planning



**November 2009**

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Appendix A	Middle Harbor Redevelopment: Water Quality Monitoring for Dredging Activities	
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## LIST OF ACRONYMS AND ABBREVIATIONS

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BMP	best management practice
CAAP	Clean Air Action Plan
CSTF	Contaminated Sediment Task Force
CWA	Clean Water Act
cy	cubic yard
DTSC	Department of Toxic Substances Control
MLLW	mean lower low water
MOA	Memorandum of Agreement
Project Port	Middle Harbor Redevelopment Project Port of Long Beach
RWQCB	Regional Water Quality Control Board
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
Weston	Weston Solutions, Inc.
WDR	Waste Discharge Requirement
WQC	Water Quality Certification
WRAP	Water Resource Action Plan

## 1 INTRODUCTION

The Middle Harbor Redevelopment Project (Project) is a large strategic redevelopment project in the Port of Long Beach (Port), Long Beach, California. Project elements include dredging, importing, and placing materials. This project-specific Sediment Management Plan was developed to:

- Illustrate the Port's decision process for the management of sediments generated within and imported to the Port
- Define management priorities for contaminated and uncontaminated sediments
- Define procedures for the maintenance of water quality during the movement (importing, mining, exporting, and disposal) of sediment
- Serve as a guidance document for Port Engineering and Environmental Planning throughout the life of the project (more than 10 years)
- Be a living document that will continue to be updated as conditions change

This document addresses these goals by providing:

- A summary of the anticipated Project sediment budget and project schedule
- A description of the Port's priorities for locating, evaluating, and accepting fill material
- Guidance for applying best management practices (BMPs) to dredge and fill operations as well as for evaluating imported material

### 1.1 Project Summary

In April of 2010, the Port will begin construction of the Project, which includes the expansion and modernization of existing marine terminals and other Port land and water areas to accommodate a portion of the forecasted increase in containerized cargo. The Project comprises a number of activities within the Middle Harbor area (Figures 1 and 2), including consolidating terminals on Piers E and F; repairing and modernizing Port facilities; implementing Green Port policies and the Clean Air Action Plan (CAAP); improving terminal traffic flow and cargo handling operations; and increasing intermodal railyard facilities. The entire Project is estimated to require 10 years to complete, will be accomplished in multiple stages, and take place while the container terminals remain in operation. The construction activities that are relevant to water quality include: 1) Slip 3 and

East Basin dredging; 2) Piers D and E Demolition; 3) Piers D and E excavation and dredging; 4) rock dike construction; and 5) filling of Slip 1 and East Basin (Figure 3). The Port has structured this Sediment Management Plan around the expected activities in order to facilitate compliance with the relevant water quality permits (see Section 3).

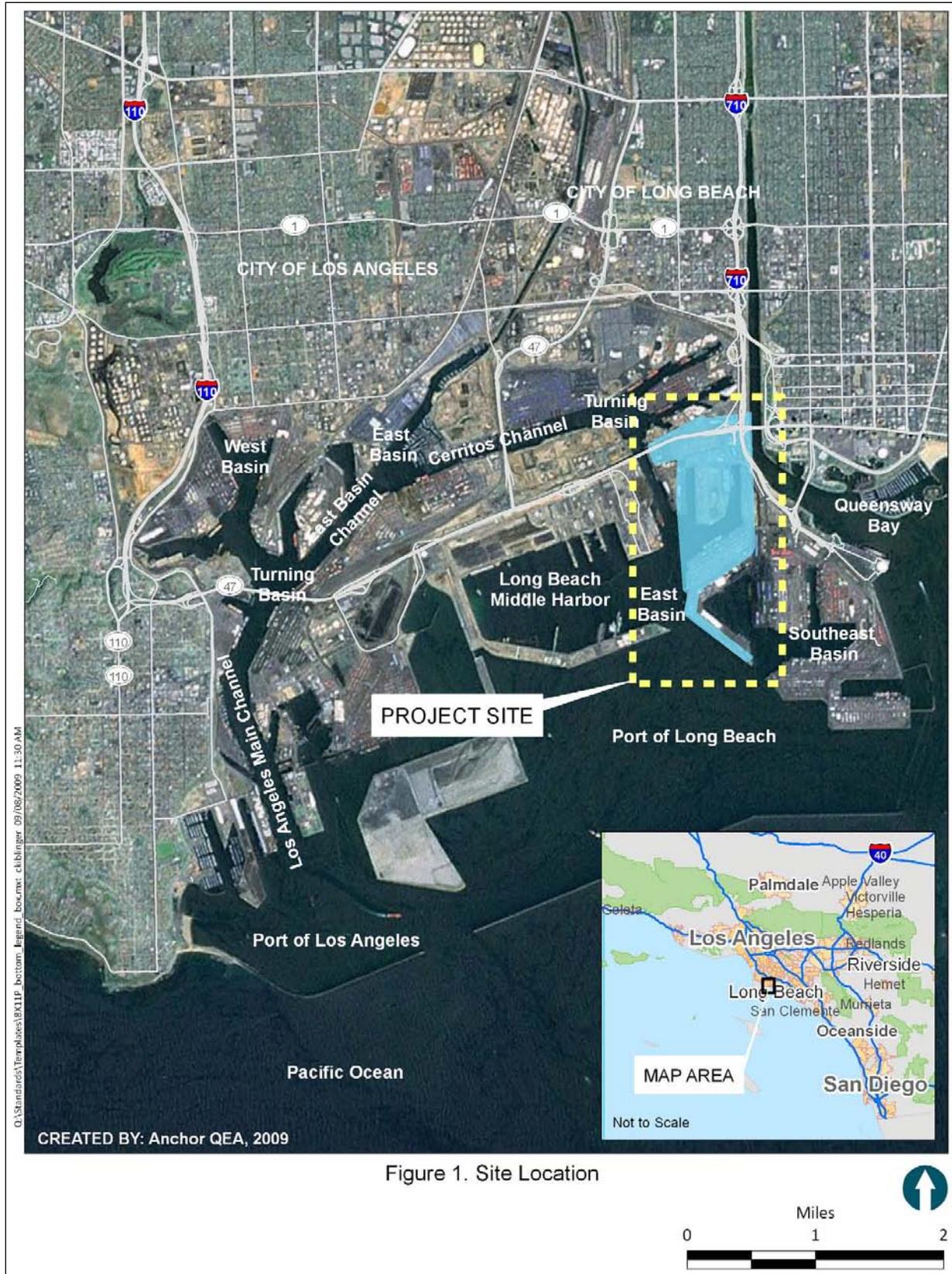


Figure 1. Site Location



SOURCE: Moffat and Nichols 2006, USA Imagery  
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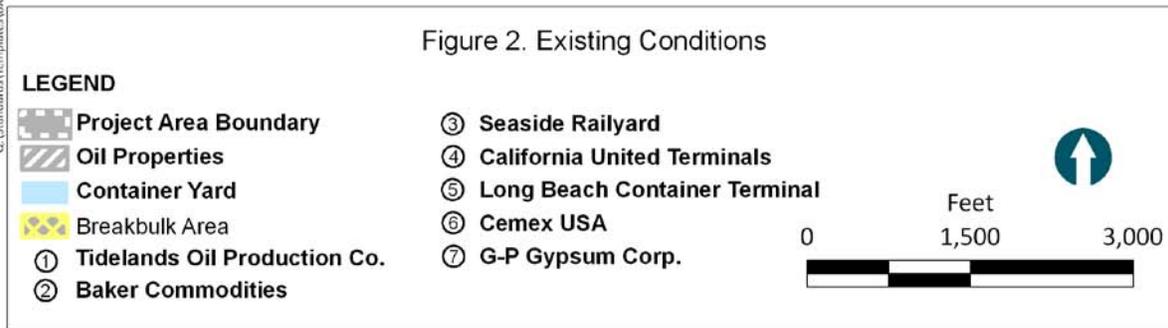


Figure 2. Existing Conditions



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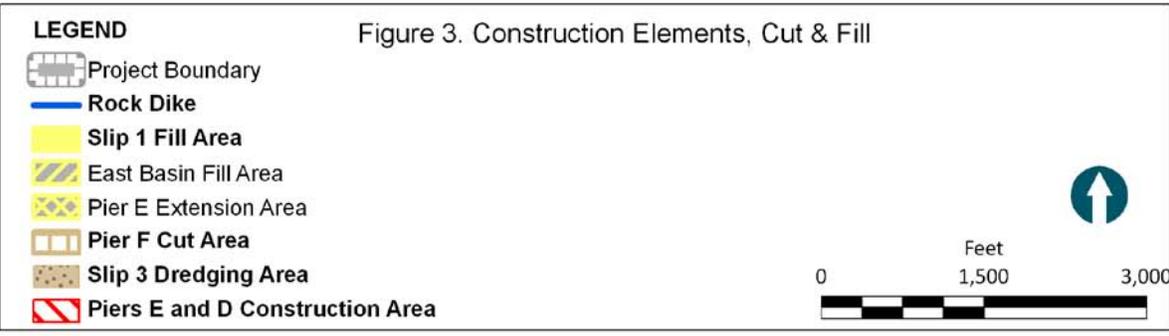


Figure 3. Construction Elements

## 1.2 Construction Activities

### 1.2.1 Slip 3 and East Basin Dredging

The primary dredge footprint is within Slip 3, which lies between Piers D and E in the Middle Harbor (Figure 2). Slip 3 runs north-south and is approximately 2,500 feet in length and approximately 350 feet across. Slip 3 will be widened by 117 feet and deepened to -55 feet mean lower low water (MLLW) to accommodate deep-draft cargo ships that require sufficient width to maneuver safely up to and away from berths. Minor dredging will occur in Slip 1 and the East Basin to prepare the sites of the landfill containment dikes. The Project is estimated to generate approximately 290,000 cubic yards (cy) of dredged material, including bulking factors. Material generated from dredging activities will be beneficially reused as fill for Slip 1 and the East Basin extension area (see Section 1.2.5).

Most of the dredged material will be generated through the deepening of Slip 3, where the existing depths (ranging from -36 to -54 feet MLLW) will be dredged to -55 feet MLLW with a 2-foot overdredge allowance (-57 feet MLLW).

The material to be dredged was evaluated both for its potential suitability for use as fill material and for its chemical nature by Weston Solutions, Inc. (Weston; Weston 2006). Based on 2006 bathymetry, the proposed deepening of Slip 3 consists of dredging approximately 216,000 cy of material to a design depth of -55 feet MLLW. With a 2-foot overdredge allowance, the potential dredged material to be removed is approximately 290,000 cy of material.

#### 1.2.1.1 Environmental Considerations

The chemical concentrations in the sediment and sediment elutriates collected from Slip 3 indicate that this material is (a) not hazardous waste and (b) acceptable for use as fill in the Project. Dredging, therefore, is not expected to result in any long-term or significant impacts to water quality. Short-term impacts to water quality could occur via temporary increases in turbidity during dredging, but turbidity would be expected to dissipate rapidly following project activities, and BMPs would be employed to control turbidity, as described in Section 3.4. In addition, within the Waste Discharge Requirements (WDR) a project-specific water quality monitoring plan will be implemented to ensure water quality is maintained during dredging activities.

## **1.2.2 Piers D and E Demolition**

The existing wharf structures (e.g., concrete pilings, sheetpile and concrete retaining structures, and rock dikes) at Berths D29 to D31, E12 to E13, and E23 to E27 (Figures 2 and 3) will be demolished as one of the first steps in the construction process to widen Slip 3 by approximately 148 feet and deepen the slip to -55 feet MLLW (-57 feet MLLW, including the 2-foot overdredge allowance). Additional demolition would occur at Berth F210 late in the Project to remove a small land area needed for the final wharf configuration (Figure 2).

Construction of the new wharves, re-construction of new shorelines, and improvements to portions of existing wharves will include placement of quarry-run rock dikes with armor rock revetments or armor stone (see Section 1.2.4); installation of concrete piles, 4,200 lineal feet of steel-reinforced concrete wharf deck, sheetpiles, tiebacks, anchors; and installation of shore-to-ship infrastructure. Demolition and construction activities are not anticipated to cause any long-term impacts to water quality.

### **1.2.2.1 Environmental Considerations**

Permit-required monitoring of previous in-water construction projects has shown that substantial resuspension and dispersal of sediments does not occur (USACE/Port 2009). Short-term, less-than-significant impacts may occur due to increases in turbidity or the presence of debris at the project site; however, BMPs will be implemented, as appropriate, to ensure that any impacts are negligible. Potential BMPs that may be implemented are described in Section 3.4.

Activities associated with the installation of shore-to-ship infrastructure, wharf deck, anchors, and tiebacks as well as the removal and replacement of concrete caps will be primarily confined to upland areas, and past experience has shown that releases of contaminants to nearby waterbodies are rare (USACE/Port 2009). Accordingly, these activities would not be expected to have adverse effects on water quality.

## **1.2.3 Piers D and E Excavation and Dredging**

Approximately 1,900,000 cy of material (1,150,000 cy from D28 to D31, E23 to E24 and 250,000 cy from E25 to E27) will be excavated and dredged from existing Berths D29 to D31 and E24 to E26 to widen Slip 3 by approximately 148 feet and deepen the slip to -55 feet

MLLW(-57 feet MLLW, including the 2-foot overdredge allowance). An additional 500,000 cy dredge/excavation would occur at Berth F210 late in the Project to remove a small land area needed for the final wharf configuration (Figure 2).

### **1.2.3.1 Environmental Considerations**

Excavated and dredged material that will be generated through the widening of Slip 3 was evaluated for its potential suitability for use as fill material in Slip 1 (Pacific Edge 2006). Based on design specifications, the proposed expansion of Slip 3 consists of excavating and dredging approximately 1.5 million cy of material. Pacific Edge collected and logged 45 continuous soil cores to various depths within the proposed widening area.

The soil evaluation indicates that this material is suitable for use as fill in the Project. Excavation and dredging activities are not anticipated to cause any long-term impacts to water quality. Permit-required monitoring of previous in-water construction projects has shown that substantial resuspension and dispersal of sediments does not occur (USACE/Port 2009). Short-term, less-than-significant impacts may occur due to increases in turbidity or the presence of debris at the project site; however, BMPs will be implemented as appropriate to ensure that any impacts are negligible. Potential BMPs that may be implemented are described in Section 3.4.

### **1.2.4 Rock Dike Construction**

During the first phase of construction, rock will be placed in Slip 3 to support the new wharves and placed in Slip 1 and the East Basin to create two containment dikes (Figure 3). New dikes will consist of quarry-run rock with armor-rock revetments. One rock dike will be constructed in Slip 1 for a truck access wedge fill, and a containment dike will be constructed in the East Basin and at the southern boundary of Slip 1 to prevent the movement of newly placed material and contain the final fill.

#### **1.2.4.1 Environmental Considerations**

The rock-containment dikes will prevent placed material from escaping into the harbor during fill operations (see Section 2). No long-term or significant impacts to water quality are anticipated as a result of rock placement. Short-term increases in turbidity may occur following the placement of rock; however, because BMPs will be employed where

appropriate, during this portion of the project. Any turbidity would be localized and short term. Potential BMPs that may be implemented are described in Section 3.4.

### **1.2.5 Filling of Slip 1 and the East Basin**

The Middle Harbor fill site, located in the Slip 1 and East Basin fill areas, will create approximately 65 acres of new land and require approximately 4.8 million cy of fill material. Fill activities will include placement of material dredged and excavated from Pier D, Pier E, the East Basin, and Slip 3 during the first phase of construction (as described above) and the placement of additional material imported from outside the Project and from the excavation of land at Berth F210. A Fill Plan (Section 2) has been developed to describe the logistical and technical considerations associated with maintaining water quality during the placement of materials in the Middle Harbor fill site. It is anticipated that the Port will require approximately 2.6 million cy of imported fill. The Port has developed an order of priority for acceptance of materials into the fill sites (Section 2.2).

## 2 FILL PLAN

The Middle Harbor Fill Plan is designed to ensure that environmental controls for the protection of water quality are applied to the placement of fill material and used appropriately. Descriptions of the logistical and technical considerations associated with the maintenance of water quality during these activities are provided here to serve as guidance for Port staff throughout the life of the Project.

It is the Port's intent to accommodate as much dredged material from third-party projects (i.e., projects undertaken by entities other than the Port) as possible within the constraints of the Project's schedule. In an effort to help those planning projects that might utilize this disposal opportunity, the Port's current schedule and estimated fill capacities are described in the following sections.

### 2.1 Logistical and Technical Considerations

Unlike a typical dredge disposal location, the Middle Harbor fill site is a key component of a much larger, time-critical Port redevelopment project. The timing of the placement of material is critical to the subsequent terminal construction activities, but it is also dependent on the timing of preceding construction activities. As a result, the temporal window for fill construction, and hence the acceptance of third-party material, is both narrow and subject to change as the project advances.

The main fill activity within Slip 1 and the East Basin is currently scheduled for the 20-month window between November of 2010 and June of 2012. This schedule is dependent on the construction of the fill retention dike, which is expected to be finished in late 2010. Placement of material prior to the completion of the dike may be possible if all required regulatory approvals for early placement are obtained by the third party.

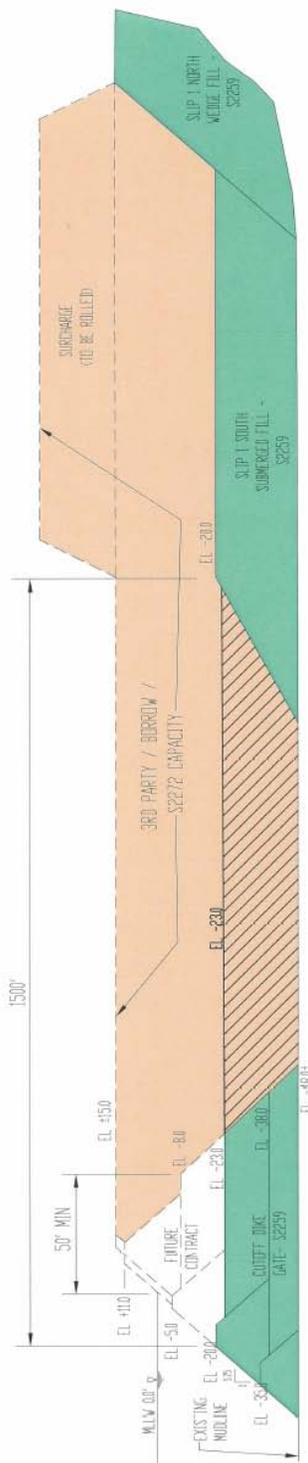
A simplified cross section of the fill site is provided (Figure 4). The Pier E extension and north wedge sites will be filled first. The fill retention dike will be built to +11 feet MLLW on the northwest portion of the East Basin (around the Pier E extension area, see Figure 3). The containment dike will transition from +11 feet MLLW to a subsurface berm (-5 feet MLLW). The easternmost portion of the containment dike will be submerged to an elevation of -20 feet MLLW to allow barge access to the fill site and to facilitate removal of

existing wharf structures on Pier F as part of a subsequent construction phase. Final construction designs will raise the fill to approximately +15 feet MLLW.

### **2.1.1 Volume of Material**

The fill site will require approximately 4.8 million cy of material to complete the Project. Dredging and excavation activities within the Project are estimated to generate 2.2 million cy. Therefore, approximately a 2.6 million cy of material will be needed from other non-project sources to complete the fill.

PRELIMINARY CAPACITY CALCULATION  
 "GEOTECHNICALLY UNDESIRABLE MATERIAL"



A FILL SECTION  
 2 NOT TO SCALE

GEOTECHNICALLY POOR QUALITY  
 CAPACITY 600,000 CYS

DRAFT  
 WORK IN PROGRESS  
 CONCEPTUAL ONLY

Figure 4. Draft Cross Section of Middle Harbor Fill Site

### **2.1.2 Placement Methods**

It is expected that barges or scows maneuvered by tugboats will transport the dredged material to the Slip 1 fill site; material excavated as part of wharf demolition may be brought to the fill site by trucks that would dump directly into the fill. Barges would deposit the dredged material behind the containment dike inside the slip. When the fill site reaches an elevation of approximately -10 feet MLLW, it will be infeasible for certain types of bottom-dump barges to enter the fill area. From this point forward, rehandling of dredged material will be necessary; it is assumed that the dredged material will be lifted over the dike and into the fill by a clamshell bucket, a hydraulic offloader, a material conveyor, or a similar methodology, at the contractor's discretion. Regardless of the method selected, the water quality outside of the construction project area may not be compromised during the offloading process (see Section 3.3 for water quality discussion).

### **2.1.3 Sediment Quality**

Material to be placed within the fill site will have limitations on its quality, both chemical and structural. The fill site has been engineered to safely contain chemically impacted materials using a containment berm of monolithic dike design along with a sand filter layer behind the rock; the Port assumes that the sand layer would be at least 50 feet thick in horizontal dimension. In addition, the material will be covered with up to 24 feet of clean fill from other sources, and paved with asphalt.

#### **2.1.3.1 Chemical Nature**

The material to be used as fill must meet minimum chemical criteria. Contaminated sediments from river and harbor dredging are, in general, chemically acceptable, but very heavily contaminated sediments that would fall into any of the following three categories would not be acceptable. Material that:

1. Constitutes "hazardous waste" as termed by the U.S. Environmental Protection Agency (USEPA) or the California Department of Toxic Substances Control (DTSC)
2. Is deemed unsuitable for confined aquatic disposal by the USEPA
3. Has land use restrictions or other long-term operations and maintenance requirements imposed by California DTSC or other regulatory agency will not be placed at the fill site

### **2.1.3.2 Structural Nature**

From a geotechnical performance standpoint, medium- and coarse-grain sands are the optimum fill material for this site, and fine sands are also suitable structural material. Fine-grained material (silt and mud) is structurally poor, and its incorporation into the fill generally increases costs and takes more time to consolidate than the use of sandy material. Only a limited amount of fine-grained material can be accepted at a given point in fill construction, and the amount decreases as the elevation of the fill rises. Recognizing that it is the Port's intent to accommodate as much material from other sources as possible, it is expected that portions of the fill will contain fine-grained materials. To the extent practical, those fine-grained materials will be placed lower in the fill and spread evenly over the fill to avoid compromising the geotechnical stability of the fill.

At this time, it is difficult to predict the volume of fine-grained material that the site will be able to accommodate. The limitations of geotechnically unsuitable materials will increase as the site fills. Ultimately, each project's material placed in the site will influence subsequent fill requirements. The Port will evaluate proposed fill materials to determine, based on a geotechnical analysis, if the material can be incorporated into the fill and, if so, where it must be placed.

### **2.1.4 Potential Sources of Fill Material**

In addition to the material generated within the Project, other material within the Port (e.g., capital and maintenance projects) may be used as fill. Sources of material outside the Port may include dredging projects undertaken by third parties, such as the City of Long Beach maintenance dredging project, U.S. Army Corps of Engineers (USACE) projects, and other regional projects. In addition, material may be available from the Western Anchorage Sediment Storage and Disposal Site. If these sources cannot satisfactorily fulfill the Project needs (e.g., due to material quality and availability), the Port may be required to create borrow areas within the harbor where suitable and where resources exist. The Port has established an order of priority and requirements that will guide the selection and use of these sources (see Section 2.2).

## 2.2 Prioritization of Fill Material

While the Port is generating fill material as part of the project, the Port will also be accepting fill from outside sources to benefit both the Project and the region. The Port will evaluate every potential fill source in accordance with its priority protocol, as described below. The final decision as to whether a given material can be accepted will be made on a case-by-case basis but will be based upon four criteria:

- Schedule, the timing of its delivery relative to the progress of fill construction
- Fill composition, the nature of the fill material, both chemical and geotechnical
- Documentation, the required permits, insurance, licenses, and agreements
- Geographic source, the location of the fill material

The interplay of those four factors will determine the priority of each potential opportunity. In each case, the Port will document the decision-making process.

Through early disclosure of the Fill Plan, the Port hopes to identify candidate projects that are interested in contributing dredged material to the Middle Harbor fill site. The Port will enter into discussions with third-party project sponsors through the Contaminated Sediment Task Force (CSTF) to initiate coordination. Any use of the Middle Harbor fill site as a disposal site for third-party projects will need to satisfy the logistical, technical, and environmental considerations outlined above as well as meet the criteria described below.

Interested third parties should bring forward dredging projects that are characterized (to a minimum grain size and chemistry), designed (to a minimum 30% engineered designs), and funded. After preliminary agreement of compatibility of project material for Middle Harbor fill, the third parties will need to demonstrate that permits and dredging contracts will be in place to meet fill schedules prior to formal agreements between the Port and the third parties (see Section 2.2.3.2). While the Port will work closely with third parties and the CSTF, the Port's program managers for Engineering and Environmental Planning will be the sole decision makers regarding acceptance of fill material. If, in their opinion, a potential source of material will not be able to meet the schedule requirements, the Port will turn to the next project in the order of priority. In order to ensure that fill material will be available when it is needed and can be accommodated, the Port, in concert with the CSTF, may undertake negotiations and coordination with several sources at the same time.

### **2.2.1 Schedule**

Once a fill is undertaken, construction generally proceeds as expeditiously as possible. Material from outside sources must be delivered on a schedule that will be determined by a combination of factors, including the nature of the material, its placement in the fill, other construction activities at the site, and terminal operational constraints. For planning purposes, each Port fill project will have a tentative schedule. As the project progresses, the schedule will be refined and the temporal windows for material acceptance will be narrowed. Accordingly, prospective fill sources will need to work closely with the Port program managers regarding the progress and status of both the fill project and their own projects, and must be ready to undertake their own projects in order to deliver material on time.

Contractors placing fill in the Middle Harbor fill site will be required to coordinate with the Port Construction Manager and Project contractor(s) concerning marine equipment operations, access to the site, and terminal activities. In addition, there will be reporting requirements for contractors delivering material to the site.

### **2.2.2 Fill Composition**

The material accepted in the Slip 1 fill must meet minimum chemical criteria (Section 2.1.3.1) and have certain structural characteristics.

### **2.2.3 Documentation**

A potential source of material must demonstrate that placement in a Port fill will comply with relevant laws and regulations and that the Port will be provided with a reasonable degree of protection from legal and financial liability. Accordingly, before being accepted, a project proposing to supply material for Port fills must receive all required regulatory approvals and permits, enter into a Memorandum of Agreement (MOA) with the Port, and possibly obtain other licenses and approvals. Potential material that cannot meet the requirements summarized below may not be accepted into a Port fill.

#### **2.2.3.1 Permits**

Potential fill material must have WDRs from the relevant Regional Water Quality Control Board (RWQCB) or a Water Quality Certification (WQC; for USACE projects) that recognize

the Middle Harbor fill site as a potential disposal site and incorporate the conditions specified in this Middle Harbor Sediment Management Plan. Any permits issued pursuant to Section 404(b)1 of the Clean Water Act (CWA) must likewise recognize the Port's fill and must not impose disposal restrictions that could conflict with or supplement the Port's Site Management Plan.

#### **2.2.3.2 Memorandum of Agreement**

Entities proposing to place material in a Port fill must enter into a Memorandum of Agreement (MOA) with the Port that defines the obligations of each party. The exact form of the MOA will vary from project to project, but certain elements are likely to be addressed in all cases. For example, projects outside the Port will likely be required to indemnify the City of Long Beach (of which the Port of Long Beach is a part) against losses arising from placement of the material, including losses due to accidents, delays, and interference with the Port's project. The City of Long Beach may require that a bond be posted. The outside entity will agree to operate in accordance with the Port's Site Management Plan and to obtain all required permits and approvals, and may be required to contribute financial support for implementation of the Site Management Plan (e.g., monitoring and site BMPs).

#### **2.2.4 Geographic Source**

The Port recognizes that there can be substantial regional benefits to accepting contaminated sediments from sources outside of the Long Beach Harbor District. While working toward providing a regional benefit, the Port must ensure that its own sediment management needs are met. Accordingly, the Port has established a hierarchy of priority for accepting material into its fills. Potential sources of material are listed below in descending order of priority based on geographic location.

1. Material generated by other elements of the development project of which the fill is a part; these materials must be accommodated in order to ensure that the Port's project can be completed on schedule (e.g., dredged and excavated material from phases one and two of the Project have first priority in the fill sites)
2. Material from other Port dredging projects, with first priority given to agency-mandated remedial dredging, second to capital projects, third to maintenance dredging, and fourth to voluntary hotspot clean-up projects

3. City of Long Beach material that is unsuitable for unconfined aquatic disposal (e.g., Los Angeles River, Queensway Bay, Alamitos Bay, and Colorado Lagoon)
4. Port of Los Angeles material from remedial dredging projects linked to attainment of Total Maximum Daily Load (TMDL) compliance for Los Angeles/Long Beach Inner and Outer Harbor waters (in support of the Water Resource Action Plan [WRAP])
5. City of Long Beach material that is suitable for unconfined aquatic disposal but cannot be beneficially reused elsewhere
6. Port of Los Angeles material that is unsuitable for unconfined aquatic disposal
7. Western Anchorage sediment storage and disposal site, much of which is structurally adequate material that Port has stored for future use
8. Material from dredging projects within Los Angeles County (but outside the ports) that is unsuitable for unconfined aquatic disposal, in support of the intent and objectives of the Contaminated Sediments Task Force Strategy
9. Material from dredging projects outside Los Angeles County (e.g., Newport Bay and Ventura Harbor) that is unsuitable for unconfined aquatic disposal
10. Material from Port of Los Angeles dredging projects that is suitable for unconfined disposal but cannot be beneficially reused elsewhere
11. Sand borrow from within the Port

### **3 ENVIRONMENTAL CONTROLS**

#### **3.1 Section 404/Section 10 Permit**

The Section 404/10 permit issued by the US Army Corps of Engineers will include environmental controls, which are made a part of this Sediment Management Plan by this reference. Details of those controls will be included here when available.

#### **3.2 Waste Discharge Requirements (Water Quality Permit)**

An application for the CWA Section 401 WQC/WDR has been submitted to the Los Angeles RWQCB for the various construction activities conducted as part of the Project. By structuring around activities, a consistent set of conditions can be applied to all activities within each category. The Port believes this approach has advantages over the case-by-case structure used in the past, as it will streamline controlling, monitoring, and reporting on this large construction process.

##### **3.2.1 Water Quality Monitoring Program for Dredging Activities**

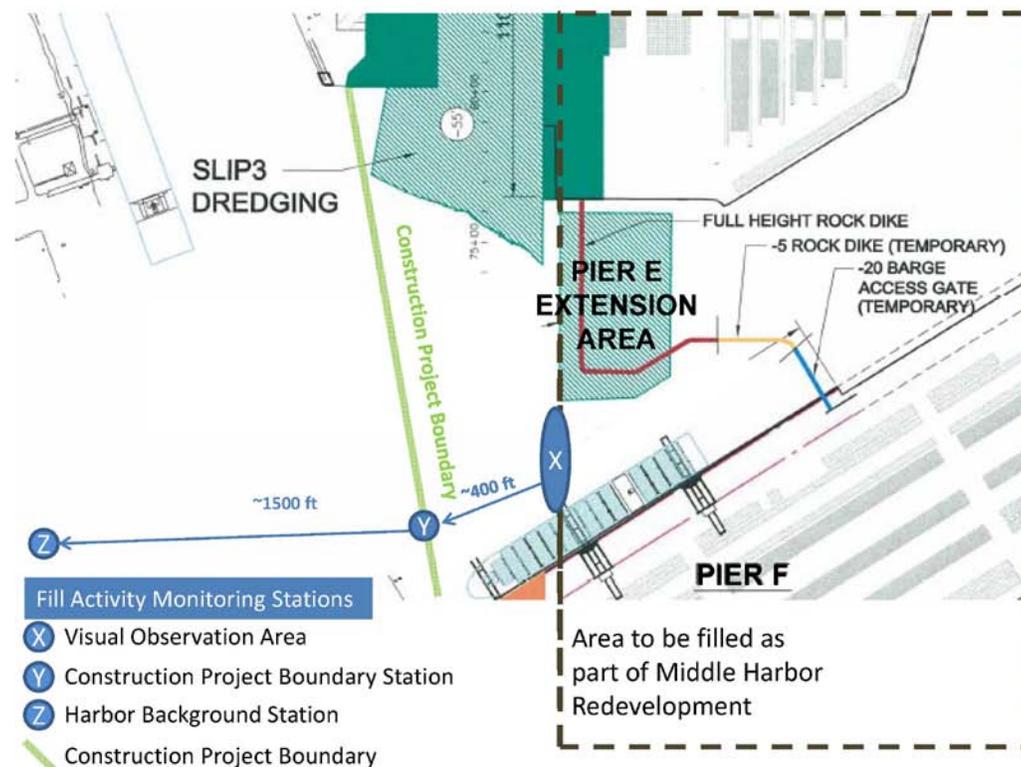
The Port has developed a project specific approach for assessing water quality during dredging activities. The dredging water quality monitoring plan proposed by the Port is provided in Appendix A. BMPs that may be implemented to increase water quality during dredging operations are summarized in Section 3.4.2 below. The water quality monitoring activities and potential BMPs may be modified or limited by intermittent terminal operation activities (e.g., ship movement).

#### **3.3 Water Quality Monitoring Program for Material Placement Activities within Fill Area**

A water quality monitoring plan for the area outside the fill has been developed by the Port to be implemented by the Port. This plan will describe methods and documentation for the monitoring of turbidity, pH, dissolved oxygen, and chemical constituents, as necessary. It is anticipated that fill activities will produce return water that will be released to the East Basin, just beyond the rock dike (Figure 5). Accordingly, the Port has designated a construction project boundary that defines the area in which temporary water quality impacts may occur. BMPs will be used, as needed, to limit the escape of suspended particulates beyond the construction project boundary. Water quality monitoring will occur

if visual observations conducted by Port staff indicate that a fill generated turbidity plume extends approximately 1,000 feet beyond the sediment containment dike (referred to as Station X). If a turbidity plume is observed, water quality will be monitored at two locations (Stations Y and Z). The monitoring stations are presented in Figure 5 and described below:

- Station X is located approximately 1,000 feet from the submerged containment dike. This area will be monitored by visual observations. If turbidity generated from fill operations is observed at the surface, water quality monitoring will be conducted at Stations Y and Z, and BMPs to improve water quality will be implemented.
- Station Y is located at the construction project boundary. This station defines the construction area; beyond which temporary water quality impacts related to filling activities will be limited.
- Station Z is located approximately 1,500 feet from the construction project boundary. This station defines the harbor background and is compared to Station Y to determine if temporary water quality impacts are extending to Station Y.



**Figure 5. Water Quality Sampling Locations during Filling of Slip 1 and the East Basin**

### 3.3.1 Water Quality Monitoring Procedures

Daily observations of the East Basin will be conducted when sediment is being placed at the site. Water quality monitoring will occur if a suspended sediment plume in the vicinity of Station X is observed by Port staff. A field team will be mobilized to collect water quality information at Stations Y and Z. Once the water quality field measurements confirm the presence of a plume at Station Y, the contractor offloading material within the fill site will be notified, and BMPs will be implemented. Station Y will continue to be monitored until the plume diminishes. Monitoring will resume when needed based on visual observations. Figure 6 describes the field monitoring program. The water quality monitoring activities and potential BMPs may be modified or limited by intermittent terminal operation activities (e.g., ship movement).

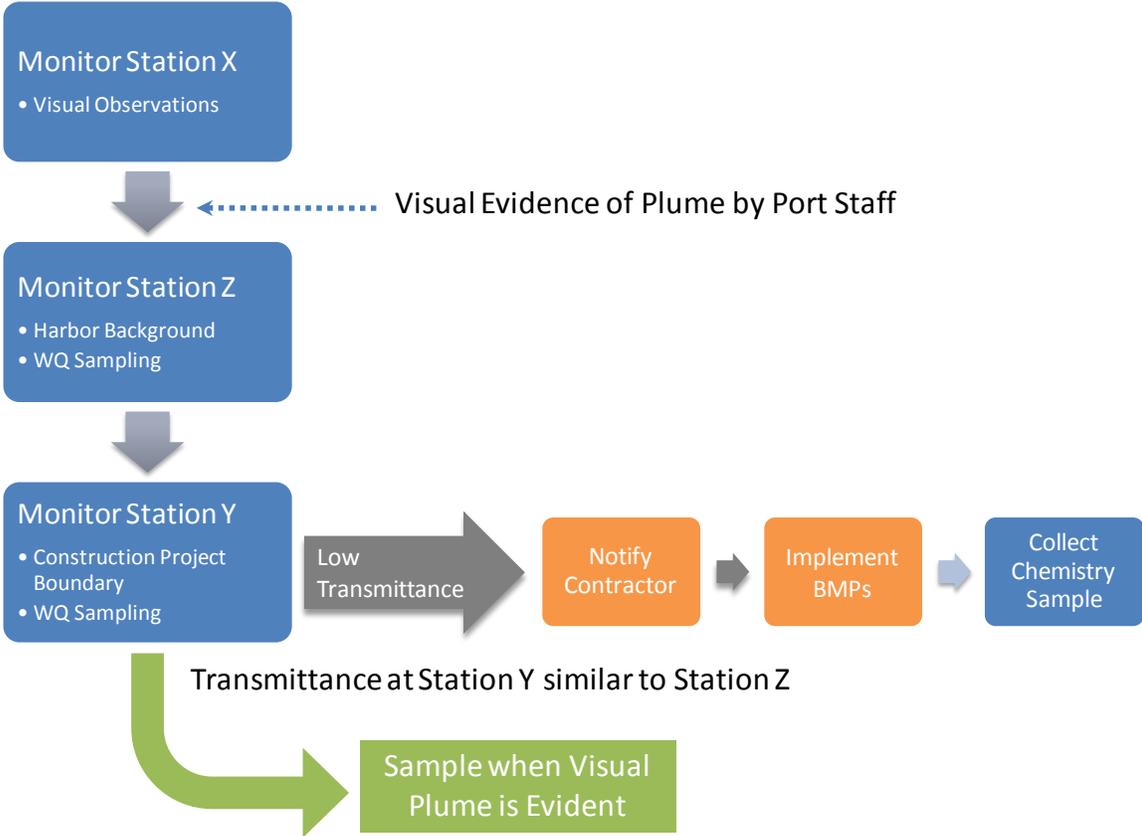


Figure 6. Water Quality Monitoring Program during Filling of Slip 1 and the East Basin

### 3.3.2 Water Quality Measurements for Fill Activities

Water quality will be monitored for light transmittance (i.e., turbidity), dissolved oxygen (DO), pH, and suspended solids. In general, water quality parameters will be collected with field probes to monitor short-term water quality impacts from fill activities. Monitoring equipment will include turbidity, DO, and pH probes. Field probes will provide “real-time” monitoring data, and results can be evaluated during fill activities. A grab sample from mid-water depth will be collected and analyzed for suspended particulates and chemistry when a visual plume is evident. Equipment will be maintained in good-working order and in safe working condition at all times. Survey equipment will be maintained and calibrated in accordance with manufacturer specifications.

**Table 1**  
**Water Quality Monitoring**

Parameter	Units	Station	Frequency
Turbidity <sup>1</sup> (light transmittance)	% transmittance	Y and Z	When visual observations of plume at Station X
DO <sup>1</sup>	mg/L		
pH <sup>1</sup>	pH units		
Suspended solids	mg/L		
Water chemistry: metals, DDTs, PCBs, and PAHs	µg/L or ng/L		

Notes:

- 1 Measurements shall be taken throughout the water column (at a minimum, 2-meter increment).

µg/L = microgram per liter

mg/L = milligram per liter

ng/L = nanogram per liter

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

Visual observations and relevant information will be recorded and photographed in the field, including:

- Field observations during sample collection, such as date, time, weather conditions, and tide
- Evidence of floatable and suspended materials, such as trash, oily slick, and grease
- Evidence of discoloration and turbidity, such as description of color, source, and size of affected area

### **3.3.3 Contingency Actions for Persistent Water Quality Exceedances**

If light transmittance at Station Y is more than 30 percentage points less than Station Z after BMPs have been implemented, further corrective actions to modify sediment placement operations will be taken immediately to reduce suspended materials. The contractor will be notified and required to cease operations until suspended sediments are reduced and the cause of the plume has been determined. Sediment placement BMPs will be employed as needed (see Section 3.4.3).

### **3.3.4 Reporting and Record Keeping**

Monitoring reports will be maintained at the Port. The Port or its contractor will maintain daily records of all water quality monitoring results. In addition, the Port or its contractor shall maintain information of equipment used, including calibration and maintenance records. BMPs may be limited by terminal operation activities.

## **3.4 Potential Project Best Management Practices**

The activities that may adversely affect water quality include wharf demolition, wharf and dike construction, dredging, and material placement within the Middle Harbor fill site. The following sections summarize/outline BMPs that may be implemented to minimize the impacts of these activities.

### **3.4.1 Wharf Demolition and Wharf and Dike Construction Best Management Practices**

- Demolition debris will be removed from waters of the state/United States daily and stockpiled until disposal.
- A solid debris curtain will be maintained in place during all demolition activities to isolate the active demolition area from the surrounding waters.

### **3.4.2 Dredging Best Management Practices**

- A Water Quality Monitoring Plan (approved by the RWQCB) will be implemented by the Port during dredging. This plan will describe methods and documentation for the monitoring of turbidity, pH, and dissolved oxygen during dredging.
- The contractor will be required to ensure that no overflow will be permitted from scows.
- If increased turbidity is observed outside the allowable mixing zone at the dredge site, the following specific BMPs may be implemented:
  - *Increasing cycle time.* To control turbidity, longer cycle time would be used to reduce the velocity of the ascending loaded bucket through the water column, which reduces the potential to wash sediment from the bucket. Limiting the velocity of the descending bucket reduces the volume of sediment that is picked up and requires more total bites to remove the project material. The majority of the sediment resuspension, for a clamshell dredge, occurs when the bucket hits the bottom.
  - *Eliminating multiple bites.* Until the turbidity exceedance is resolved, the contractor would be prohibited from using multiple bites of the dredge's clamshell bucket. When the bucket hits the bottom, an impact wave of suspended sediment travels along the bottom away from the dredge bucket. When the clamshell bucket takes multiple bites, the bucket loses sediment as it is reopens for subsequent bites. Sediment is also released higher in the water column as the bucket is raised, opened, and lowered.
  - *Eliminating bottom stockpiling.* The contractor would be forbidden to use bottom stockpiling to increase the efficiency of the dredging operation. Bottom stockpiling of the dredged sediment in silty sediment has a similar effect as

- multiple bite dredging: an increased volume of sediment is released into the water column from the operation.
- *Silt curtain*. If the above measures prove inadequate, a silt curtain would be deployed around the dredging site.

### **3.4.3 Material Placement within Fill Site Best Management Practices**

Releases of dredged sediment outside of the Middle Harbor fill site could occur during transport of the material from the source areas to the Port or during disposal into the fill area. Flat-deck barges, scows, and/or haul barges that transport dredged sediment to and through the Port must be sealed to prevent leakage during transport. Any barges or scows that do not seal properly must be removed from operation until satisfactory repairs are made. The contractor will control disposal of materials within the fill, so that loss of suspended sediment outside of the facility itself, as determined by water quality monitoring, will be below the limiting criteria set forth in WDRs for this project.

Placement of fill is not expected to have any long-term or significant impacts to water quality (USACE/Port 2009). During placement of dredged sediment within the fill, the contractor(s) will be required to implement measures (see below) to minimize the loss of sediment, whether contaminated or clean, from within the fill. These measures will be in effect both during the period when the dike is partially completed and when the dike has reached its full height.

Contaminated sediments are more likely to travel out of the fill site when the sediments are suspended in the water column (evident by level of turbidity). Each fill site will include a weir system designed to maximize the settlement of fine material into the fill and minimize the amount of sediment that escapes in the return water. The specific design of the weir will vary with the fill geometry and the status of the fill. Loss of material could result from placing sediment too close to the dike or weir, disposing of sediment at too high a rate, or spilling sediment from barges or rehandling equipment. Monitoring by the Port will minimize the likelihood or significant losses of material.

Nevertheless, once placement of sediment within a given fill is completed, the contractor may be required to perform a final dredge pass over the area immediately adjacent to the

containment berm in order to remove any escaped dredged material and place it back within the fill. The Port Engineer may elect to forego this additional dredging requirement if, in the Engineer's opinion, no significant contaminated sediment has escaped the slip fill area during its filling and the escaped material poses no risk to maritime operations. This determination will be based on observations via surveys and on water quality monitoring during the filling process.

BMPs to be implemented during the placement of material within the Middle Harbor fill site will include:

- Dredged material placement will be protected from exposure to surrounding waters by the quarry rock dike. Material will be placed landside of the dike, thus protecting surrounding waters. A Solids Waste Management Plan will be implemented to reduce the potential for movement of sediment out of the fill.
- Bottom-dump barges shall be positioned at a sufficient distance inside the slip to minimize the chance that excessive turbidity is released beyond the slip fill limits and that light transmittance requirements are exceeded outside the dike. When the dike is completed to full height, with a temporary drainage weir, the contractor shall conduct sediment rehandling and placement to minimize loss of suspended sediments through the weir. This can be accomplished by positioning the discharge point as far as possible from the weir. As the area fills up, however, the discharge will have to take place closer and closer to the weir. At this stage, if the contractor is unable to prevent turbidity from escaping through the weir, it will be necessary to install a filter fabric barrier or continuous floating silt curtain across, or just outside of, the weir outflow point to prevent the passage of suspended sediments out into the adjacent water area.
- During hydraulic placement of material, water outside of the fill will be monitored visually for increases in turbidity. Substantial visible contrast with the appearance of the surrounding water would trigger the following actions. Hydraulic placement of material would be slowed. If this action is not sufficient, then a floating silt curtain would be placed around the discharge site to contain the turbidity plume and prevent heightened turbidity outside of the project area.

#### **3.4.4 Third Party Environmental Controls**

All contractors conducting work within the Port will be required to meet all regulatory requirements. Permit requirements associated to third-party dredge programs must be complied with and are the sole responsibilities of the third party. Any permit requirements beyond those listed in the Project WDRs must be disclosed to the Port program managers.

#### 4 REFERENCES

Pacific Edge Engineering, Inc. (Pacific Edge). 2006. Subsurface Investigation Report: Port of Long Beach Pier E/Middle Harbor Redevelopment. Long Beach, California.

Weston Solutions, Inc. (Weston). 2006. Chemical and Physical Characterization of Sediments within Slip 3 for the Pier E Redevelopment Program at the Port of Long Beach. Long Beach, California.

U.S. Army Corps of Engineers and Port of Long Beach (USACE/Port). 2009. Middle Harbor Redevelopment Project. Final EIS/EIR and Application Summary Report. SCH 2004091010.

APPENDIX A  
MIDDLE HARBOR REDEVELOPMENT:  
WATER QUALITY MONITORING  
PROGRAM FOR DREDGING ACTIVITIES

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## 1 WATER QUALITY MONITORING OBJECTIVES

The water quality monitoring program described below will be conducted during dredging activities. The objectives of the water quality monitoring program include:

- Ensuring that water quality conditions are within the prescribed limits of relevant regulatory requirements
- Designating water quality monitoring procedures
- Planning appropriate project best management practices (BMPs) to avoid and minimize project impacts to the maximum extent practicable
- Documenting the results of water quality performance monitoring

## 2 WATER QUALITY MONITORING APPROACH

Due to the configuration of Slip 3, the nature of the dredged material, the type of dredging, and the pier construction activities occurring within and adjacent to the slip at the time of dredging, the Port expects prolonged suspension of dredge-mobilized particulates within the construction area. Accordingly, the Port has designated a construction project boundary that defines the area in which temporary water quality impacts may occur. BMPs will be used as needed to limit the escape of suspended particulates at the mixing zone boundary, located 300 feet beyond the construction project boundary. Water quality monitoring will be conducted at four locations (Stations A, B, C, and D) during each sampling event, as presented in Figure A-1 and described below:

- Station A is located approximately 1000 feet up current (on a flooding tide) of the construction project boundary. This station defines the nearby harbor background.
- Station B is located approximately 200 feet beyond the construction project boundary. This station defines the BMP screening station.
- Station C is located approximately 300 feet from the construction project boundary. This defines the dredging mixing zone boundary, beyond which temporary water quality impacts related to dredging activities are not to occur.
- Station D is located approximately 1,500 feet from the construction project boundary. This station defines the harbor background and is compared to Station C, to determine if temporary water quality impacts are extending to Station C, the allowable mixing zone.

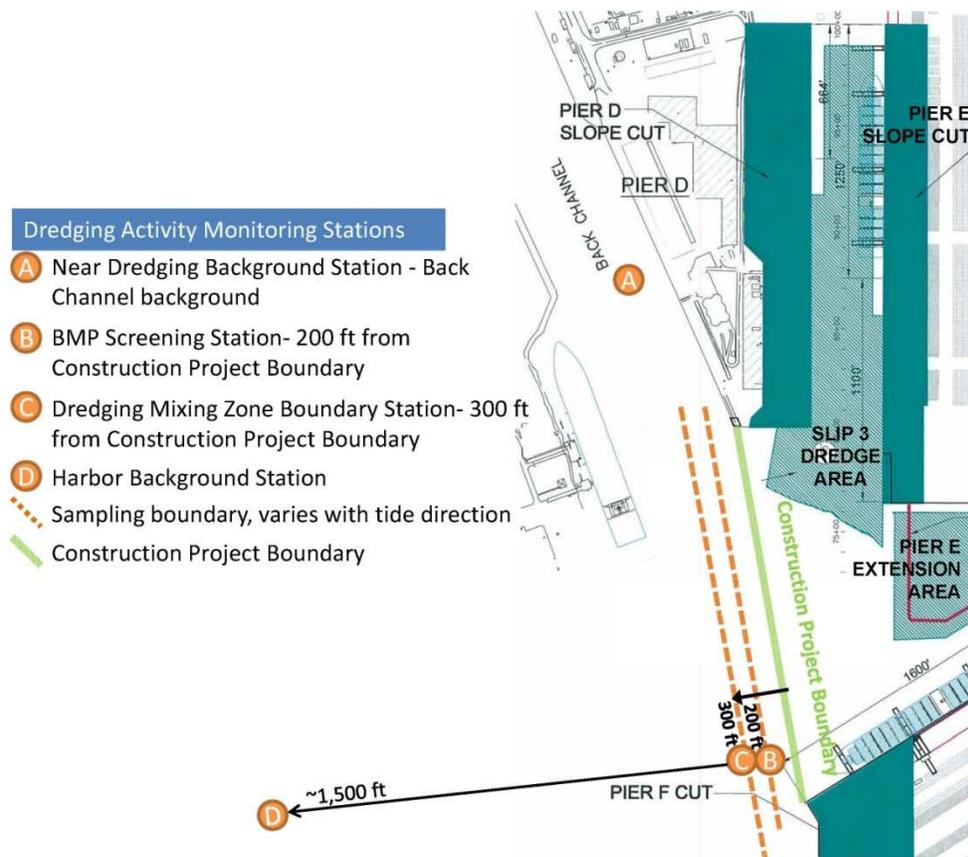


Figure A-1. Water Quality Sampling Locations during Dredging of Slip 3

### 3 WATER QUALITY MONITORING PROCEDURES

Water quality monitoring will be conducted at least once a week during dredging operations, beginning 1 week prior to dredging and ending 1 week after dredging is complete. Water quality conditions will be measured at each station at the three monitoring depths:

- Near surface: 3 feet below the water surface
- Mid-water: 6-foot increments averaged throughout the water column, between the near surface and bottom
- Bottom: 3 feet above the sediment surface

Figure A-2 describes the field monitoring program. Each day of monitoring, water quality will be measured at Stations A and D prior to the beginning of dredging activities to measure near and far background conditions. Water quality at Station B will be measured at least 1 hour after the start of dredging to allow sufficient time for dredging activities to influence water quality, should temporary impacts exist. If light transmittance at Station B is less than at Stations A and D, indicating elevated suspended particulates in the area that may be due to dredging activities, the dredge contractor will be notified and BMPs to improve water quality will be implemented. Water quality monitoring at Station B may continue for up to 2 hours to evaluate effectiveness of newly implemented BMP.

Water quality at Station C will then be monitored. If light transmittance at Station C is at least 30 percentage points lower than Station D (see criteria discussion in Section 3.2), the dredging contractor will be notified and additional BMPs will be implemented. Station C will continue to be monitored until light transmittance is within 30 percentage points of Station D. At that time, monitoring will terminate for the day and resume the following week. However, if after 2 hours of continuous monitoring, light transmittance at Station C continues to be at least 30 percentage points lower than at Station D, a chemistry sample will be collected and water quality monitoring will continue daily until light transmittance meets the criteria for two consecutive days. A maximum of one chemistry sample will be collected each week from the depth with the greatest difference in light transmittance from Station D. The chemistry sample will be analyzed for priority pollutants (see Section 3.1).

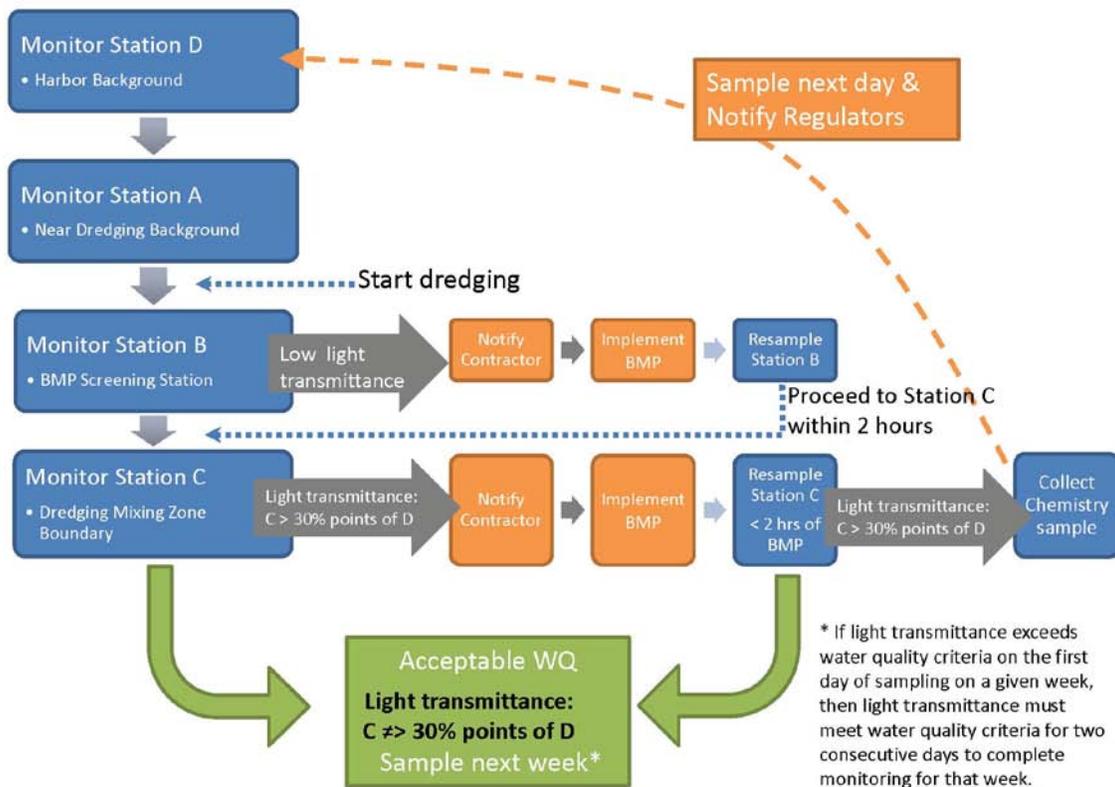


Figure A-2. Water quality Monitoring Program During Dredging Activities

### 3.1 Water Quality Measurements

Water quality will be monitored for light transmittance (i.e., turbidity), dissolved oxygen (DO), pH, and suspended solids. In general, water quality parameters will be collected with field probes to monitor short-term water quality impacts from dredging activities. Monitoring equipment will include turbidity, DO, and pH probes. Field probes will provide “real-time” monitoring data where the results can be evaluated during dredging activities. A grab sample from the mid-water depth will be collected and analyzed for suspended particulates. Table A-1 lists specific criteria for water quality monitoring. Additional water chemistry grab samples may be collected as required based on the presence of decreased light transmittance (see Section 3.2). Equipment will be maintained in good-working order and in safe working condition at all times. Survey equipment will be maintained and calibrated in accordance with manufacturer specifications.

**Table A-1  
Water Quality Monitoring**

Parameter	Units	Station	Frequency
Turbidity <sup>1</sup> (light transmittance)	% transmittance	A through D	Bi-weekly for first two weeks of dredging then weekly
DO <sup>1</sup>	mg/L		
pH <sup>1</sup>	pH units		
Suspended solids	mg/L		
Water chemistry: metals, DDTs, PCBs, and PAHs	µg/L or ng/L	C and D	At least once during program or as required with elevated turbidity at Station C

Notes:

- 1 Measurements shall be taken throughout the water column (at minimum, 2-meter increments).  
µg/L = microgram per liter  
mg/L = milligram per liter  
ng/L = nanogram per liter  
PAH = polycyclic aromatic hydrocarbon  
PCB = polychlorinated biphenyl

Visual observations and relevant information will be recorded and photographed in the field, including:

- Field observations during sample collection, such as date, time, weather conditions, and tide
- Evidence of floatable and suspended materials, such as trash, oily slick, and grease
- Evidence of discoloration and turbidity, such as description of color, source, and size of affected area
- Dredge history information including the previous day’s depth of dredge operations, previous day’s dredge production, and project’s cumulative total of material dredged to date

**3.2 Water Quality Criteria for Dredging Activities**

Water column light transmittance at each of the three depth intervals at Station C will be compared to the same depth interval at Station D. Values at Station C that are at least 30 percentage points less than at Station D at any of the three depth intervals would be an indication that water quality may be temporarily impacted by dredging activities. Dredging-

related BMPs will be employed as needed (see next section). If BMPs are not able to reduce turbidity after 2 hours, a water chemistry grab sample will be collected at Stations C and D. Water chemistry at Station C may be compared to Station D to delineate harbor-wide water quality values from dredge-related water quality values. The water chemistry grab sample will be collected at the depth with the least light transmittance (i.e., greatest turbidity) and will be analyzed for trace metals, DDTs, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). If light transmittance exceeds water quality criteria on the first day of sampling on a given week, then light transmittance must meet water quality criteria for two consecutive days to complete monitoring for that week, as described in Figure A-2.

### **3.3 Potential Project Best Management Practices**

BMPs will be implemented to minimize potential water quality impacts if elevated turbidity (i.e., decreased light transmittance greater than 30 percentage points above the harbor background) is observed at the edge of the dredging mixing zone (300 feet beyond the construction project boundary). Dredging related BMPs are summarized in the Middle Harbor Sediment Management Plan.

### **3.4 Executive Officer Oversight**

The Executive Officer of the Regional Water Quality Control Board (RWQCB) has the authority to amend the sampling procedures should the available information support the changes that will add efficiencies to the water quality sampling program. If the results of three consecutive water chemistry samples demonstrate that there are no contaminants of concern associated with the increased turbidity, then further chemistry sampling may not be required at the discretion of the Executive Officer. In addition, if the decreased light transmittance at Station C appears to be due to other, non-dredge related activities, then further chemistry sampling may not be required at the discretion of the Executive Officer.

### **3.5 Reporting and Record Keeping**

Monitoring reports will be submitted to the Regional Water Quality Control Board within 10 days following each weekly sampling period or receipt of water chemistry, when conducted. Reports will be provided to the RWQCB in the format requested. The Port or its contractor will maintain daily records of all water quality monitoring results. In addition, the Port or

its contractor shall maintain information for equipment used, including calibration and maintenance records.