REMEDIATION MONITORING PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

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LIST OF ACRONYMS AND ABBREVIATIONS

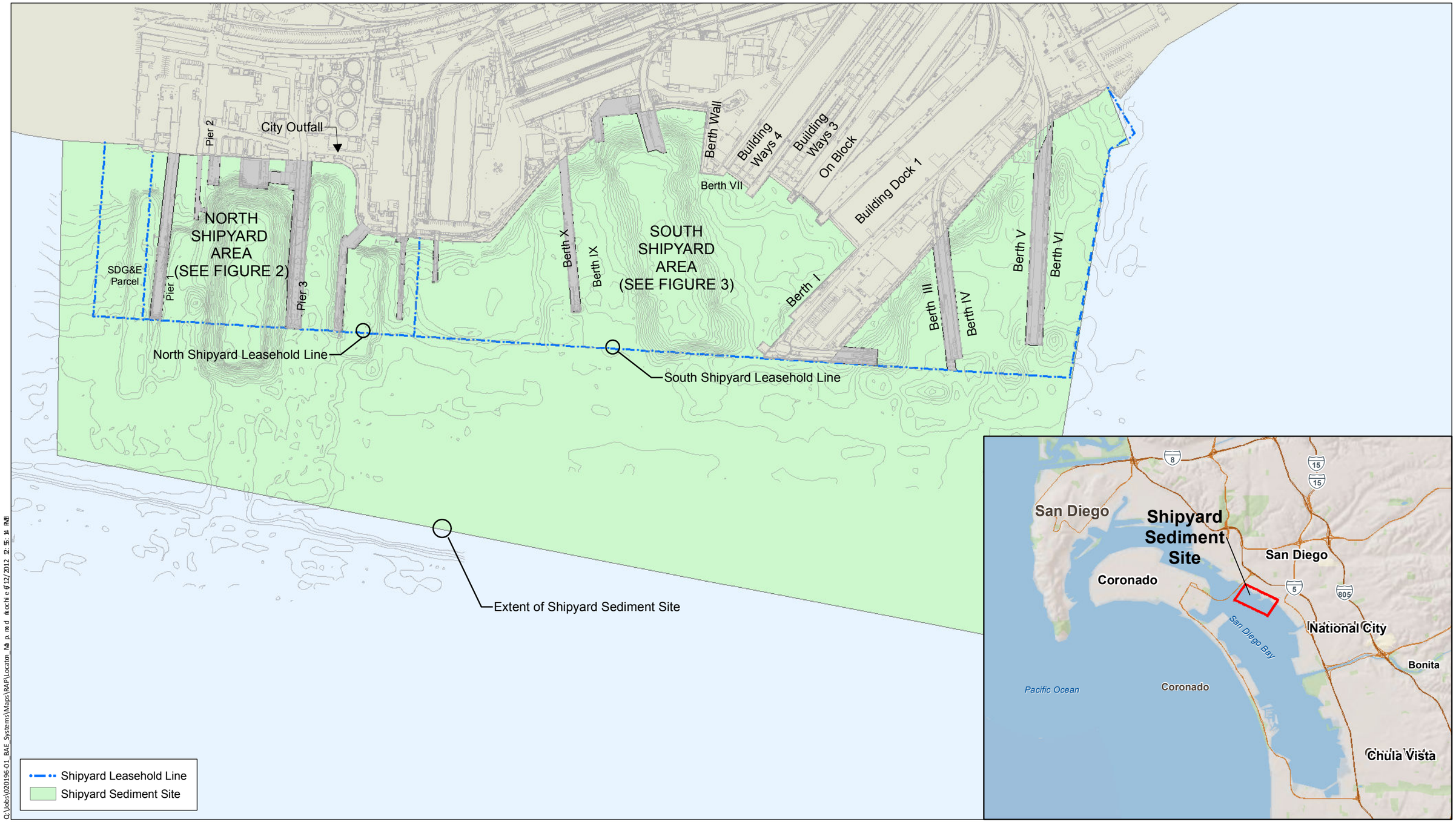
µ	microgram
Basin Plan	*Water Quality Control Plan for San Diego Basin*
BMP	best management practice
CAO	Cleanup and Abatement Order
cm	centimeter
DGPS	differential global positioning system
DO	dissolved oxygen
kg	kilogram
L	liter
mg	milligram
MMRP	Mitigation Monitoring and Reporting Program
NTU	nephelometric turbidity unit
Ocean Plan	*Water Quality Control Plan for Ocean Waters of California*
QAPP	Quality Assurance Project Plan
pH	hydrogen ion concentration
RMP	Remediation Monitoring Plan
Shipyard Sediment Site	San Diego Shipyard Sediment Site
Water Board	San Diego Regional Water Quality Control Board

1 INTRODUCTION

In March 2012, the San Diego Regional Water Quality Control Board (Water Board) issued Cleanup and Abatement Order (CAO) No. R9-2012-0024 for the remediation of marine sediments containing elevated chemical concentrations within the San Diego Shipyard Sediment Site (Shipyard Sediment Site) in San Diego, California (Water Board 2012a). The Shipyard Sediment Site includes the waters adjacent to two adjoining, active shipyard facilities in San Diego Bay—the North Shipyard (owned BAE Systems San Diego Ship Repair Facility) and the South Shipyard (owned National Steel and Shipbuilding Company Shipyard Facility). Figure 1 depicts the location of the Shipyard Sediment Site and the layout of the North and South Shipyard Areas. The Shipyard Sediment Site remedial footprint extends from the U.S. Bulkhead Line (shoreline) to San Diego Bay's main shipping channel to the west.

This Remediation Monitoring Plan (RMP) is one component of the Remedial Action Plan (RAP) for the Shipyard Sediment Site. This document describes provisions for water quality and sediment monitoring sufficient to demonstrate that implementation of the remedial action does not result in violations of water quality standards and that target cleanup levels are achieved by the work. The RMP is organized as follows:

- Section 1: Introduction
- Section 2: Water Quality Monitoring
- Section 3: Sediment Monitoring
- Section 4: Biological Monitoring
- Section 5: Potential Response Actions
- Section 6: Reporting



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Feet
0 200 400 600 800

Figure 1
Site Map
San Diego Shipyard Sediment Site

1.3 Objectives of the RMP

Monitoring during remediation activities is stipulated by the CAO (Water Board 2012a), to document that the following cleanup objectives are achieved:

- Water quality standards are met outside the remedial footprint.
- Target cleanup levels are reached within the remedial footprint.
- Sensitive biological resources, such as eelgrass, marine mammals and sea turtles, are protected.

Monitoring activities will include water quality, sediment, and biological monitoring. Dredged material disposal monitoring is discussed in the Quality Assurance Project Plan (QAPP; Anchor QEA 2012a) and is not included in this RMP.

2 WATER QUALITY MONITORING

Water quality will be monitored during all marine construction activities, including dredging, placement of rock for the protection of marine structures and slopes, remediation of underpier areas, and placement clean cover. The objectives of the water quality monitoring program are as follows:

- Ensure that water quality conditions are within the prescribed limits of relevant regulatory requirements.
- Designate water quality monitoring procedures.
- Plan appropriate project best management practices (BMPs) to avoid and minimize project impacts to the extent practicable.
- Designate contingencies should water quality exceedances occur.
- Document the results of water quality performance monitoring.

By collecting water quality samples at a prescribed frequency throughout the marine construction activities, short-term water quality impacts from dredging activities can be monitored to allow for corrective actions or procedure modifications to be made to bring construction activities into compliance with water quality performance criteria.

This monitoring program has been developed to ensure full compliance with the Water Quality Control Plan for San Diego Basin (Basin Plan; Water Board 1994) and the Water Quality Control Plan for Ocean Waters of California (the Ocean Plan; State Water Resources Control Board 2005). In addition, this RMP has been developed to address substantive anticipated requirements of the Section 401 Water Quality Certification associated with implementation of the remedial action.

2.1 General Water Quality Protection Measures:

Several BMPs can be used by the contractor to meet contract and permit requirements for minimizing resuspension, spillage, and misplacement of sediment during dredging and material placement activities. A list of possible BMPs, including operations controls and silt curtain deployment, is presented in the QAPP (Anchor QEA 2012a).

2.2 Water Quality Monitoring Program

The objective of water quality monitoring is to confirm that water quality criteria are met or to ensure approval to allow temporary exceedances of water quality standards during any construction activity that may affect the water column. This monitoring program described here is designed to implement the automated monitoring system defined in the Environmental Impact Report (EIR; Water Board 2012b) and its associated Mitigation Monitoring and Reporting Program (MMRP; Section 7 of the EIR). The automated monitoring system may be augmented with occasional manual measurements if needed to ensure accuracy of the monitoring system.

The details of the water quality monitoring program, including monitoring parameters, compliance criteria, monitoring station locations and depths, filed procedures, and monitoring personnel and responsibilities, are provided below.

2.2.1 Monitoring Parameters

The following parameters will be monitored outside of the construction area during removal action construction activities (see Table 1):

- Visual parameters
  - No floating particulates, suspended materials, grease, or oil
  - No significant discoloration of the water surface
- Field parameters
  - Turbidity (in nephelometric turbidity units [NTU])
  - Dissolved oxygen (DO; in milligrams per liter [mg/L])
  - Hydrogen ion concentration (pH)

Table 1
Water Quality Compliance Criteria

Parameter	Compliance Boundary Standard
Visual	• No significant floating particulates, suspended materials, grease, or oil shall not be visible • No aesthetically undesirable discoloration of the water surface
Turbidity	• No more than 20 percent above background turbidity levels when background less than 50 NTU • No more than 10 NTU above background when background between 50 and 100 NTU • No more than 10 percent above background turbidity levels when background greater than 100 NTU
DO	• Not depressed more than 10 percent below the background DO levels
pH	• No more than 0.2 above or below background levels • Within limits of 6.0 and 9.0 at all times

Notes:
Table taken from Basin Plan (Water Board 1994).

2.2.2 Compliance Criteria

The water quality criteria based on the Basin Plan (Water Board 1994) that will be applied to this project are discussed below and specified in Table 1. The point of compliance with these criteria will be located 500 feet from the edge of the construction area. The construction area is defined as the area(s) occupied by the dredging barge(s), the sediment scow(s), sand and rock placement equipment, demolition work, and other work, as delineated by the outermost silt curtain.

In the event of an exceedance of water quality criteria at the point of compliance, the response actions described in Section 5.1.1 will be implemented.

2.2.2.1 Visual

There shall be no visible floating particulates, suspended materials, grease, or oil sheens determined to be emanating from the construction area. There shall be no distressed or dying fish as a result of the site construction activities.

2.2.2.2 Turbidity

At the point of compliance (i.e., 500 feet from the edge of the construction area), turbidity shall not have a 20 percent increase over background levels when background turbidity is less than 50 NTU. When background turbidity is between 50 and 100 NTU, turbidity shall not exceed 10 NTU over background at the compliance boundary. If background turbidity is greater than 100 NTU, turbidity at the point of compliance shall not have a 10 percent increase over background levels.

2.2.2.3 Dissolved Oxygen

At the point of compliance, DO shall not have a 10 percent decrease from background DO levels.

2.2.2.4 Hydrogen Ion Concentration

At the point of compliance, pH shall not be 0.2 above or below background levels. pH shall not be lower than 6 and shall not be higher than 9 at any time.

2.2.3 Monitoring Locations and Depths

During each monitoring event, DO, turbidity and pH will be measured to ensure compliance with the water quality criteria listed in Table 1. Turbidity measurements will be monitored on two arcs outside the construction area: one arc at 250 feet and one arc at 500 feet. Samples will be collected from a depth of 10 feet below the water surface. Monitored turbidity measures will be compared to "ambient" background measurements outside the construction area, including San Diego Bay conditions and effects of non-remedial shipyard activities. Measurements from the 250-foot arc are intended to warn of potential problems with the point of compliance at the 500-foot arc.

Station descriptions are as follows:

- **Background (B)**, a single station located 800 feet (or more) and up current from the outermost dredging and sand placement limits, at a distance and location that is far enough away from the activities to be relatively uninfluenced by them and a water depth similar to the active dredging water depth.
- **Compliance (C)**, located on a 500-foot arc from the construction area. This arc

defines the site compliance zone boundary.

- **Early Warning (E)**, located on a 250-foot arc from the construction area. This arc is an additional "early warning" boundary.

Water quality will be monitored 10 feet below the surface at each of the stations.

2.2.4 Field Procedures

2.2.4.1 Methods and Equipment

Conventional parameters (turbidity, DO, and pH) will be measured using real-time, calibrated automated field equipment (hydroprobe or equivalent) deployed to the appropriate depth in the water column.

2.2.4.2 Sample Location and Depth Control

A laser range finder and/or differential global positioning system (DGPS) will be used to locate and establish station locations. Location control data will be documented on a water quality monitoring form.

2.2.4.3 Station Identification

All stations will be properly identified on the water quality monitoring form, and consistently applied from one monitoring event to the next. Station names will use the following identification scheme consisting of four alphanumeric characters:

A-B-C-

Where:

A The first character defines the monitoring station number.

B The second character will be used to identify the construction activity being monitored:

- D = dredging
- P = material placement

C The next character will be used to identify the water quality monitoring location:

- B = background station

- E = early warning station
- C = compliance station, bank (along the right river bank)

2.2.4.4 Field Documentation

Water quality measurement data that is automatically recorded will include date, time, turbidity, pH, and DO measurements.

Documentation of visual water quality monitoring will include the following:

- Location of observations
- Date and time
- Relevant description of observation(s)
- Tidal phase (flood, ebb, slack)
- Predominant direction of current
- Weather and wind conditions

Any instances of apparent water quality exceedances or alarms will be brought to the attention of the Project Coordinator.

2.2.4.5 Equipment Calibration and Maintenance

Monitoring equipment will undergo routine and ongoing calibration according to the manufacturers' instructions prior to use in the field. The automated monitoring system with occasional manual measurements may be augmented by trained personnel if needed to ensure accuracy of the monitoring system and/or to confirm specific measurements.

Instruments and equipment will be tested and inspected before each monitoring event. Any field equipment that is faulty or not functioning properly will not be used for monitoring.

2.2.5 Monitoring Personnel and Responsibilities

Key monitoring personnel required to implement this WQMP include the following:

- Water Quality Field Leader
- Monitoring personnel

Persons fulfilling these roles will be designated at least 1 week prior to the start of monitoring activities, and contact information will be provided at that time to the Water Board and the Project Team. All monitoring personnel will be experienced in the collection and measurement of water quality parameters.

2.2.5.1 Project Team Responsibilities

The Project Team will be responsible for:

- Reviewing field reports to verify that appropriate field methods and quality control procedures are being implemented in accordance with the procedures specified in this WQMP
- Coordinating with the contractor to ensure appropriate construction BMPs are being implemented, and to strategize ways to add BMPs or enhance the effectiveness of existing BMPs as necessary to mitigate unacceptable water quality effects
- Submission of records to regulatory agencies as required by permits

3 SEDIMENT MONITORING

A post-remedial bathymetric survey will be performed to verify that the contractor has reached the target dredging depths and extents to accomplish full removal of chemically impacted sediment. Subsurface samples will be obtained and analyzed immediately after dredging in each cleanup area to ensure cleanup levels comply with the CAO (Water Board 2012a).

3.1 Performance Standards for Dredging

The contractor will be required to remove sediments to depths and extents shown on the construction plans, which will be verified through bathymetric surveys as indicated in the QAPP (Anchor QEA 2012a). Once it has been adequately demonstrated that the required dredging depths have been achieved, the effectiveness of sediment removal will be determined by evaluating the sediment quality of the post-dredge sub-surface. The Project Team will conduct post-remedial confirmatory sampling to determine if cleanup levels are achieved or if further cleanup activities are required as described in the confirmatory sampling approach (see Section 3.2). If concentrations of primary contaminants of concern in subsurface sediments (deeper than 5 centimeters [cm]) are above 120 percent of post-remedial dredge area concentrations (Table 2) after completion of initial dredging, the potential response actions described in Section 5.2 will be evaluated.

Table 2
Post-Remedial Dredge Area Concentrations

Chemical	Units (dry weight)	Post-Remedial Dredge Area Concentrations	120 Percent of Post-Remedial Dredge Area Concentrations
Copper	mg/kg	121	145
Mercury	mg/kg	0.57	0.68
Tributyltin	µg/kg	22	26
HPAH[1]	µg/kg	663	796
Total PCB Congeners[2]	µg/kg	84	101

Notes:
Table taken from CAO (Water Board 2012a)
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
1 HPAHs = sum of six PAHs: Fluoranthene, Perylene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenzo(a,h)anthracene.

2 Total PCBs = sum of 41 congeners: 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194, 201, and 206.

3.2 Confirmation Sampling Objectives and Approach

The objective of confirmation sediment monitoring is to determine if cleanup activities have met the cleanup objectives prior to the demobilization of the construction operation. Estimates of sediment conditions will be established using average chemical concentrations within the remedial footprint.

As is the case for any dredging project, a thin surface layer of unconsolidated (residual) sediment is anticipated to remain in place after dredging has been completed. This can may lead to the continued presence of near-surface chemical exceedances after dredging. In addition, it is also possible that contamination will extend to depths greater than were originally anticipated during the pre-design process. In either case, concentrations in post-dredge confirmational subsurface samples could require further dredging or placement of a clean sand cover. Section 5.3 summarizes the potential outcomes from the confirmational samples and the actions or non-actions for each outcome.

To determine if the cleanup goals have been obtained, sediment cores will be collected within the removal area. A sediment coring device will be used to obtain a surficial sample (0 to 5 cm) and a subsurface composite sample (5 to as much as 60 cm). The surficial sample (0 to 5 cm) will likely be comprised entirely of residual sediment material that was re-deposited by the dredging process. (The thickness of residual deposits after dredging can be up to several inches thick.) The subsurface samples, therefore, are important, because they will extend beyond the residual layer into the underlying, undredged materials, and therefore will be more representative of actual post-dredging bottom conditions.

3.3 Methods, Locations, and Timing

A brief summary of the monitoring methods, locations, and timing is provided in the following subsections. Detailed procedures for subsurface and surface sediment sampling are provided in the Sampling Analysis Plan (Anchor QEA 2012b) for this work. Detailed field and laboratory quality assurance and quality control criteria, including method

specifications, detection limits, accuracy and precision requirements, are provided in the Post-Remedial Monitoring Plan [Exponent 2012]).

3.3.1 Sediment Sampling Methods

The confirmation subsurface sediment samples will be collected using a vibracore coring device or similar deployed from a winch line on a sampling vessel. Cores will be advanced up to 60 centimeters, or until refusal.

3.3.2 Sediment Sample Locations

Subsurface sediment sample locations will be systematically distributed to confirm performance objectives have been achieved in each cleanup area. The horizontal extents of the final cleanup areas will be determined during final design as described in the RAP and Design Criteria Report (Anchor QEA 2012c and 2012d, respectively). Once cleanup areas have been established, confirmation sediment sample locations will be designated.

3.3.3 Chemical Analytical Parameters

The subsurface depth horizon (5 to 60 cm) samples will be analyzed for and compared to the post-remedial dredge area concentrations provided in Table 2. Aliquots from the 0 to 5 cm interval will be archived. Consistent with the post-remedial program requirements and best dredge practices, these samples may be used to determine the need for a clean sand cover.

3.3.4 Monitoring Timing

All confirmational sampling is estimated to occur within 24 to 48 hours after dredging has been completed within each cleanup area. This timeframe is needed to allow dredge residuals (sediment suspended during dredging) sufficient time to settle and, should additional remedial activities be required, ensure that the test results are received prior to the contractor demobilizing from the Shipyard Sediment Site.

4 BIOLOGICAL MONITORING

As required by MMRP (Water Board 2012b) mitigation measures, the following biological monitoring measures will be implemented:

- A pre- and post-remedial eelgrass survey will be performed per Southern California Eelgrass Mitigation Policy; if impacts are noted, mitigation measures will be implemented in accordance with resource agency requirements.
- Eelgrass beds will be identified and marked prior to construction by a biologist to protect sea turtles.
- Measures (e.g., speed restrictions, off-limit areas) will be implemented on construction equipment and operations to ensure eelgrass beds are not impacted as a result of the construction activities
- Construction activities will be temporarily stopped if a sea turtle or marine mammal is sighted within 100 meters of the construction area

In addition, the project specifications are expected to limit construction activities such that they are performed only during the open environmental windows for least tern, so Endangered Species Act monitoring is not anticipated to be required. If construction activities extend into the least tern window, the appropriate ESA monitoring requirements per the EIR (Water Board 2012b) will be implemented.

5 POTENTIAL RESPONSE ACTIONS

5.1 Water Quality Monitoring

5.1.1 Exceedances of Water Quality Criteria

This section describes the contingency actions that will occur if the monitoring crew reports an exceedance of a visual or conventional water quality parameter. In the event of an exceedance, the contractor shall immediately notify the Project Team and begin to implement additional or enhanced operational or engineering BMPs. The QAPP (Anchor QEA 2012a) provides a standard list of construction BMPs to protect water quality. Additional operational modifications are provided below.

5.1.1.1 Response(s) to Visual Monitoring

If visual monitoring indicates potential exceedance of water quality criteria during the removal action (i.e., visible turbidity attributed to site construction activities), preventative and/or corrective actions will be implemented described below will be followed.

5.1.1.2 Exceedance of Conventional Parameters

If conventional parameters (turbidity, DO, and/or pH) are exceeded at the compliance boundary during removal action construction activities, the following contingency actions will be implemented:

1. Evaluate the concurrent measurements at Background and Compliance monitoring stations, and supporting visual evidence, to determine whether the exceedance is caused by site construction activities versus other ambient conditions in the Bay (e.g., wind waves, boat wakes, barge/ship traffic, and storm inflow).
2. If the exceedance is confirmed, immediately notify the contractor and the Project Team. The contractor will be directed to immediately modify operations or implement additional BMPs to mitigate the exceedance (see QAPP for list of construction BMPs to protect water quality and this Section for a list of additional modifications to operations).
3. Reevaluate field measurements at all relevant stations 30 minutes later, after additional BMPs or operational modifications are implemented.
4. The contractor shall take actions to mitigate the exceedance. If the water quality exceedance continues to persist, even with additional BMPs or operational

modifications, a path forward will be discussed with the Project Team. The path forward could include some or all of the following:

- Implement more aggressive BMPs or operational modifications
- If additional measures are not successful at controlling the water quality exceedance, it may be necessary to stop work to further assess the source of the exceedance, identify effective mitigation measures, and allow the water column to recover.

5.1.1.3 Operational Modifications

In addition to the standard BMPs listed in the QAPP, the following operational modifications can be implemented individually or in combination as part of the response to a confirmed water quality exceedance:

- Adjust the sequence and/or speed of dredging and disposal operations.
- Reposition dredge operations in such a way as to ensure future exceedances do not occur.
- Fix, maintain, and/or upgrade floating silt curtains.
- Modify, either on a temporary or permanent basis, dredge equipment (such as the dredging bucket size or type).

5.1.2 Discharge of Oil, Fuel, or Chemicals

In the event of a discharge of oil, fuel, or chemicals into the Bay, the source of the spill or leak shall be identified and controlled, and cleanup efforts shall begin immediately. The contractor shall immediately notify Shipyard Sediment Site emergency response personnel, who will make all appropriate regulatory notifications in accordance with Site emergency notification procedures. Cleanup shall include appropriate disposal of any spilled material and cleanup material.

5.2 Sediment Monitoring

A decision matrix for interpreting the results of the confirmation subsurface sediment monitoring is provided in Table 3. The threshold for additional action (including additional sampling, additional dredging, clean sand placement etc.) is an average subsurface (5 to 60

cm) chemical concentration greater than 120 percent of the post remedial dredge area concentration (see Table 2).

If the average concentration is less than 120 percent of the post remedial dredge area concentration, cleanup is complete and no further action is required, through a sand cover may be applied to provide restorative layer for biological growth. If average concentrations are greater than the threshold, further testing and/or remedial actions will be required as discussed below.

5.3 Sediment Monitoring Exceedance

The following response actions will be taken in the event that an exceedance of the cleanup threshold is observed (see Table 3):

- If the exceedance is observed in a composite sample, discrete core samples for the subsurface sample (5 to 60 cm) will be submitted for analysis to determine if the exceedance is limited to a localized hot spot.
- If subsurface concentrations within area are confirmed to be greater than post-remedial dredge area concentrations, the following additional remedial actions will be evaluated:
  - Additional dredging of localized hotspot.
  - Clean sand placement.

Table 3
Confirmational Sample Remedial Action Decision Matrix

Sediment Chemistry	Sediment Condition	Remedial Action
Subsurface (5 to 60 cm) is less than 120 percent of the post-remedial dredge area concentration (see Table 2)	**Cleanup Complete** The area weighted average concentration is below the cleanup levels.	• No further remedial action; dredging activities are complete in this area. • Sand cover may be applied as a biologically restorative layer.
Subsurface (5 to 60 cm) exceeds 120 percent post-remedial dredge area concentration (see Table 2)	**Subsurface Contamination** Further testing and/or remedial actions may be required.	• Analyze individual core samples (5 to 60 cm) to determine if further cleanup is required for the entire area or if exceedance is limited to a localized hot spot • If subsurface concentrations within area are confirmed to be greater than post-remedial dredge area concentrations, then remedial actions may include:

Sediment Chemistry	Sediment Condition	Remedial Action
		– Additional dredging – Placement of clean sand (if additional dredging is determined to be inefficient or infeasible)

6 REPORTING

6.1 Weekly Reports

As required by the MMRP (Water Board 2012b), the Project Team will prepare and submit weekly water quality monitoring reports, which provide results from each week's water quality monitoring activities and will compile the results into a summary table with a comparison to water quality compliance criteria.

6.2 Quarterly Reports

As required by the CAO (Water Board 2012a), the Project Team will prepare and submit quarterly progress reports, which describe all actions taken toward achieving compliance with the CAO, as well as results of any sampling, testing, analyses, data collection, or other evaluations. Quarterly reports will be submitted by or before the 15th of March, June, September, and December of each year following the CAO's effective date. Each quarterly report will summarize current schedule and any delays or modifications to that schedule.

7 REFERENCES

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