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November 10, 2010

Ms. Barbara Cook
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Attention: Mr. Tony Natera

Subject: **Draft Final Corrective Measures Study**
Proposed Modification to Remedy
Corrective Action Consent Agreement P2-03/04-006
PG&E Shell Pond, Bay Point, California

Dear Ms. Cook:

We are herewith providing you the above document which addresses verbal comments received from DTSC on the draft document.

If you have any questions or need additional information, please call me at (925) 415-6355.

Sincerely,

Robert M. Gray
Project Manager

cc: Mr. Loren Loo
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Enclosure: *Draft Final Corrective Measures Study*
Proposed Modification to Remedy
Corrective Action Consent Agreement P2-03/04-006
PG&E Shell Pond, Bay Point, California
November 2010

Draft Final Corrective Measures Study

Proposed Modification to Remedy Corrective Action Consent Agreement P2-03/04-006 Shell Pond Bay Point, California

Prepared for

Pacific Gas and Electric Company

November 2010

Prepared by

CH2MHILL

Proposed Modification to Remedy
Corrective Action Consent Agreement P2-03/04-006
Shell Pond
Bay Point, California

November 2010

Prepared for:
Pacific Gas and Electric Company
San Ramon, CA

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Executive Summary

A modification is proposed to the current remedy prescribed in Corrective Action Consent Agreement (CA) P2-03/04-006 for the Pacific Gas and Electric Company (PG&E) Shell Pond and Carbon Black Area site in Bay Point, California. This request is in response to regulatory requirements which rendered the current remedy for the Shell Pond no longer viable or sustainable.

The Shell Pond is a 73-acre pond currently owned by PG&E. Between the late 1930s and 1980, the Shell Pond received wastewater discharges containing metals and polycyclic aromatic hydrocarbons (PAHs) from a chemical plant owned and operated by the Shell Oil Products Company and the Hysol Division of Dexter Corporation.

Section 2.10 of the CA specifies that the remedy include a circulation system to gradually reduce the salinity of water in the pond. This remedy was implemented between 2000 and 2008, but was suspended when discharge requirements could not consistently be achieved without treatment, thus rendering circulation and discharge of water no longer viable or sustainable.

The CA (Section 21.0) allows for modification of the agreement by mutual agreement between The California Department of Toxic Substances Control (DTSC) and PG&E. In accordance with this provision and in order to achieve a long-term, sustainable remedy for the site, a remedy modification is recommended that includes the following:

- Removing the layer of non-native material (non-native and non-native mixed material that exceeds proposed remediation goals) in the Shell Pond.
- Removing non-native material in the former wastewater discharge ditch leading to the Shell Pond.
- Transporting and disposing of the removed material at an offsite permitted facility.
- Breaching the Shell Pond levee to allow natural circulation, thereby eliminating the need for a circulation system for the pond.
- Restoring the pond area to a self-sustaining mixed tidal and transition habitats.
- Placing clean soil and seeding select bare portions of the Carbon Black Area.

This remedy modification has the following benefits:

- Removes non-native material and associated PAHs and metals above proposed remediation goals;
- Allows natural tidal circulation to control salinity;
- Eliminates the high level of maintenance necessary to maintain the water cap;
- Enhances the environmental and public value of the property; and

- Eliminates National Pollutant Discharge Elimination System (NPDES) discharges and the associated permits, maintenance, and monitoring activities.

Implementation of the modified Shell Pond remedy will require the following activities and work products:

- Investigation and pilot removal and stabilization studies to determine current non-native material thickness and pond bathymetry, and selection of effective and implementable non-native material removal and dewatering technologies
- Conceptual design
- Permitting
- California Environmental Quality Act (CEQA) compliance
- Design plans and specifications
- Construction work plans
- Remedy construction
- Completion report
- Restoration implementation

On the basis of pilot studies and interaction with the regulatory and resource agencies, the assumptions and costs for the remedy modification proposed for the site and described in this report may be revised during project design.

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Abbreviations and Acronyms

APN	Assessor's Parcel Number
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
CA	Consent Agreement
CBA	Carbon Black Area
CCR	Code of California Regulations
CEQA	California Environmental Quality Act
COPC	constituent of potential concern
DTSC	California Department of Toxic Substances Control
ESA	federal Endangered Species Act of 1973
EcoPRG	Ecological Preliminary Remediation Goal
FML	flexible membrane liner
GCL	geosynthetic clay liner
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PEG	Pacific Environmental Group
PG&E	Pacific Gas and Electric Company
PAH	polycyclic aromatic hydrocarbons
RCRA	Resource Conservation and Recovery Act
RWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SLERA	Screening Level Ecological Risk Assessment
SWMU	solid waste management unit
TMDL	total maximum daily load
TPH-d	total petroleum hydrocarbons-diesel
TPH-o	total petroleum hydrocarbons-motor oil
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

1.0 Introduction

An alternative remedy is proposed to the current remedy contained in the California Department of Toxic Substances Control's (DTSC's) Corrective Action Consent Agreement (CA) P2-03/04-006 for the Pacific Gas and Electric Company (PG&E) Shell Pond and Carbon Black Area (CBA). This alternative remedy was developed as a result of regulatory requirements that rendered the currently prescribed remedy no longer viable or sustainable.

The Shell Pond is a 73-acre former wastewater pond and the CBA is a 20-acre upland area, both located within a 292-acre parcel (Assessor's Parcel Number [APN] 098-260-001) in Bay Point, CA (see Figure 1-1; all figures are located at the end of this report). The Shell Pond and CBA were constructed in the late 1930s and 1940s when levees were constructed to create a basin (pond) to receive stormwater and wastewater from a commercial ammonia plant owned by the Shell Oil Products Company and the Hysol division of the Dexter Corporation (Dexter/Hysol), an adhesives manufacturer, both located south of the Shell Pond. PG&E purchased the pond and surrounding land in 1973. Discharges to the Shell Pond were terminated in 1980 (Woodward Clyde, 1986). Since 1980, PG&E has conducted investigations, monitoring, and remedial activities at this site.

The remainder of the parcel and surrounding PG&E-owned property to the east and west are primarily estuarine wetlands adjacent to Honker and Suisun Bays in the Sacramento-San Joaquin Delta.

The CA (Section 2.10) states that the approved remedy for the Shell Pond and CBA consists of:

- Site vegetation surveys, re-vegetation, and annual levee inspection and maintenance;
- Operation of a circulation system to gradually reduce the salinity of water in the pond and to maintain a water cover;
- Groundwater monitoring to evaluate if there have been releases of hazardous substances to groundwater; and
- Placement of a deed restriction on the property to prevent residential reuse.

Two of these components of the remedy are no longer occurring: groundwater monitoring and circulation with discharge. Groundwater monitoring was performed until 2007 and ceased with the concurrence of DTSC because groundwater quality was not found to be adversely affected by the hazardous substances in the Shell Pond and CBA.

PG&E maintained a water cover and operated the circulation remedy for the Shell Pond between 2000 and 2008. This remedial strategy, while protective of human health and the environment and generally effective in controlling odor and reducing salinity levels within the Shell Pond, was not a viable long-term or sustainable remedy due to the inability to comply with revised and more stringent discharge requirements, particularly new total maximum daily load (TMDL) standards for mercury under the National Pollutant Discharge Elimination System (NPDES).

To meet the long-term goals for the site, a revised remedy is proposed pursuant to Section 21.0 of the CA which specifies that the agreement may be modified by mutual agreement between DTSC and PG&E. The long-term goals for the Shell Pond are:

- Continue to protect human health and the environment
- Restore estuarine habitat compatible with areas to the north and east
- Decrease ongoing costs and operations and maintenance (O&M) requirements for regulatory compliance
- Maintain site as open space consistent with the Contra Costa County General

To meet these long-term goals, the proposed modification to the CA is to perform remedial actions at the Shell Pond to restore the area to a self-sustaining mixed tidal habitat by:

- Removing the non-native material (which includes non-native material and mixed material that exceeds proposed remediation goals) deposited in the pond when it received wastewater from the Shell Oil Products Company and Dexter/Hysol, and
- Transporting and disposing of the removed material at an offsite permitted facility.

The proposed project also includes:

- Covering unvegetated portions of the CBA with clean soil and hydroseeding the area (see Section 4.2.4), and
- Removing non-native material from the former wastewater discharge ditch leading to the Shell Pond and disposing of this material offsite (see Section 4.2.2.3).

Other remedial alternatives for the Shell Pond were evaluated, as described in Section 3.0; these alternatives include:

1. No action/maintain water cap.
2. Cover non-native material in place.
3. Consolidate and cap non-native material onsite at the adjacent CBA.
4. Consolidate and cap non-native material onsite in the south end of the Shell Pond.

1.1 Background

As noted above, the PG&E Shell Pond and adjacent Carbon Black Area were constructed in the late 1930s and 1940s when levees were constructed to create a basin to receive wastewater discharges from operations at the former Shell Oil Products Company plant and Dexter/Hysol, both located south of the Shell Pond. The remainder of the parcel and surrounding PG&E-owned property to the east and west are primarily estuarine wetlands adjacent to Suisun Bay and Honker Bay in the Sacramento-San Joaquin Delta.

PG&E acquired the property from the Shell Oil Products Company in 1973 and since the 1980s has conducted investigations, monitoring, and remedial activities at the site.

As part of the proposed remedy modification, PG&E has conducted and planned additional investigations and surveys including bench scale and pilot testing to further evaluate the site conditions and design considerations for the Shell Pond project. The following sections include preliminary information from the investigations and surveys performed as of June 2010.

1.2 Current Conditions

1.2.1 Setting

The Shell Pond is surrounded to the north and east by estuarine wetlands typical of the San Francisco Bay and Delta. Figure 1-1 shows the marsh-dominated nature of the area. Construction and use of the southern end of the parcel for wastewater containment began in the 1930s and continued until approximately 1980. This involved constructing dikes/levees to contain the wastewater. Elevations at the Shell Pond vary from approximately 9 feet NAVD88 on the top of the levee to approximately 4.5 feet at the top of sediment in the Shell Pond (ENTRIX, 2008a). Surrounding wetlands to the east and west slope to the north with elevations ranging from approximately 3 to 6 feet NAVD88. Predicted tidal elevations in the Shell Pond area are expected to be similar to that for nearby tide stations with a mean higher high water (MHHW) elevation of approximately 6 feet NAVD88, a mean tide level of approximately 3.8 feet NAVD88 and a mean lower low water (MLLW) elevation of between about 1.1 and 1.6 feet NAVD88.

A biological resource assessment performed for the Shell Pond and surrounding area indicates the area includes flora and fauna of conservation concern (ENTRIX, 2006). Species of potential concern include but are not limited to: delta smelt (*Hypomesus transpacificus*), the salt marsh harvest mouse (*Reithrodontomys raviventris*), Suisun marsh aster (*Symphyotrichum lentum*), Mason's lilaeposis (*Lilaeopsis masonii*), burrowing owl (*Athene cunicularia*), and many nesting bird species including potentially the California clapper rail (*Rallus longirostris obsoletus)* (ENTRIX, 2009). Additional biological surveys and wetland delineation have been and are being performed as required by resource agency permits and approvals and the California Environmental Quality Act (CEQA). Reports with results of these surveys and wetland delineation will be submitted with the permit documents.

Railroad tracks run in an east-west direction along the south end of the parcel (Figure 1-1). There are residential areas present approximately 1,200 feet to the southwest and 2,000 feet to the southeast of the Shell Pond. The Harris Yacht Harbor is located approximately 3,000 feet to the west. Suisun Bay and Honker Bay are located approximately 2,000 feet north of the Shell Pond.

1.2.2 Pond Characterization

Beginning in 1983, PG&E has conducted investigations of the Shell Pond including the following:

- Brown and Caldwell (1983) sampled pond water sediments and groundwater.
- Woodward Clyde (December 1986) sampled surface water, groundwater, sediments biota, and west levee soil.
- MSE Group evaluated groundwater (2007).

- ENTRIX (2008a, 2009d) conducted sampling and/or surveys of sediments, surface water, levee soils, and soils below the ditch that formerly conveyed wastewater and stormwater from the chemical plant to the pond.

In addition to the above, CH2M HILL recently conducted sampling and analysis of pond materials, bathymetric and topographic surveys, and resource surveys as part of the CEQA Initial Study (CH2M HILL, 2010). The preliminary results of these activities conducted subsequent to the initial draft of this document are considered in the development of the proposed remedy modification.

1.2.2.1 Pond Non-Native Material Characterization

Previous characterization investigations identified polynuclear aromatic hydrocarbons (PAHs), metals, and total petroleum hydrocarbons in the diesel and motor oil ranges (TPH-d and TPH-o, respectively) as constituents of potential concern (COPCs). As part of the proposed remedy modification, surveys, additional sampling, topographic and bathymetric surveys were conducted in and surrounding the Shell Pond (CH2M HILL, in preparation). Preliminary results of the sampling (Vibracore™ core sampling in the pond) and bathymetric surveys indicate that:

- The bottom of the pond is generally flat with approximately a 0.3-foot elevation change.
- The non-native material is generally a visually distinct layer on top of native alluvial and organic soil with visual evidence suggesting that the material has not mixed with more than the upper 0.5 foot of the underlying native material.
- The thickness of the non-native material (material visually distinct from underlying native material and thus identified as resulting from past wastewater discharges) was observed to range from approximately 0.5 to 2.5 feet in the Shell Pond, with the maximum thicknesses observed at locations in the north end and southeast corner of the pond.
- The non-native material generally overlies a soft to stiff younger bay mud in the southern 25 percent of the pond and very soft organic soil (peat) in the northern 75 percent of the pond.
- The estimated volume of non-native material is estimated to be approximately 150,000 cubic yards.
- Analytical results indicate that PAHs, metals (primarily copper, lead, mercury and molybdenum), TPH-d, and TPH-o are present in the non-native material at concentrations orders of magnitude higher than in the underlying native material (see Appendix A).

1.2.2.2 Pond Water Characterization

The depth of water in the pond varies from approximately 1 to 3 feet seasonally and with pond maintenance activities. COPCs found in pond sediment were present in surface water at low concentrations (Brown and Caldwell, 1983; Woodward Clyde Consultants, 1986). More recent pond water samples (ENTRIX, 2009d) are not considered entirely representative of water quality because, as noted by ENTRIX, the samples were grab water samples that were not filtered for PAHs and the non-native material was disturbed during water sampling.

Based on results of NPDES discharge sampling, the pond water has generally met NPDES discharge criteria with some exceptions. For NPDES monitoring in 2007, these exceptions included pH greater than the discharge limit of 8.5; dissolved oxygen lower than 5 milligrams per liter (mg/L); and mercury mass greater than the average monthly limit, which was based on lower discharge volumes compared to later operations (ITSI, 2008).

1.2.2.3 Groundwater Characterization

Shallow groundwater occurs first in the peat and Bay Mud at depths of approximately 2 to 6 feet below ground surface in the area outside the Shell Pond. Groundwater flow is northerly toward Suisun Bay and Honker Bay. Groundwater monitoring conducted at the site for a number of years indicates impacts to groundwater are limited and no significant risks exist to aquatic receptors (Brown and Caldwell, 1983; Woodward Clyde, 1986; MSE Group, 2007; ENTRIX, 2009 d). In 2007, the San Francisco Bay Regional Water Quality Control Board (RWQCB) found that the shallow groundwater is not a viable drinking water source based on the amount of total dissolved solids and low yields (RWQCB, 2007) and subsequently the DTSC agreed that the shallow groundwater quality was not adversely non-native by the Shell Pond and CBA (DTSC, 2007) and the groundwater monitoring program was discontinued.

1.2.2.4 Biota

Woodward Clyde (1986) found low levels of COPCs in biota at the Shell Pond and concluded that there is no evidence of biomagnification in the food chain, and that biota in the pond do not appear to pose a threat to birds and mammals that may utilize the resources of the pond. Results of a Screening Level Ecological Risk Assessment (ENTRIX, 2009d) indicated that the potential risks to receptors at the site include metals, PAHs and VOCs. Some of the metals identified as risk drivers are below background concentrations.

1.2.3 Carbon Black Area Characterization

The CBA was originally 11 acres in size and was constructed in the 1940s to receive wastewater from the former Shell Oil Products Company. Subsequently the current Shell Pond was constructed to receive wastewater, and in 1953 the CBA was expanded to 20 acres and received primarily carbon black until 1969. The carbon black in the CBA was reclaimed, reprocessed and sold until 1971 (Pacific Environmental Group [PEG], 1998).

Beginning in 1983, PG&E conducted investigations of the CBA, often in conjunction with the Shell Pond as discussed in the preceding section. Work conducted at the CBA included:

- Investigations of soil and groundwater (Brown and Caldwell, 1983; Woodward Clyde, 1986; MSE Group, 2007, 2008a)
- A fate and transport evaluation of constituents in groundwater (MSE Group, 2008)
- A Screening Level Ecological Risk Assessment (SLERA) and a supplemental human health risk assessment (HHRA Addendum) (Pacific Environmental Group, 1998)
- Removal and offsite disposal of materials as part of interim remedial measures (PEG, 1998; Shaw, 2006)

Investigations performed on the CBA found isolated areas of metals, PAHs, petroleum compounds and cyanide in soil but no significant concentrations of constituents in groundwater. In a 1997 interim action, 512 tons of tar-like material was removed from two areas in the CBA (PEG, 1998). In 2007, the RWQCB found that the shallow groundwater is not a viable drinking water source based on the amount of total dissolved solids and low yields (RWQCB, 2007) and subsequently the DTSC agreed that the shallow groundwater quality was not adversely non-native by the Shell Pond and CBA (DTSC, 2007) and the groundwater monitoring program was discontinued.

The SLERA and HHRA addendum indicate, respectively, no significant risk to ecological and human receptors attributable to the CBA in its current condition. The CBA is currently mostly flat and vegetated with grasses and coyote bush, but there are some areas of soil and carbon black with no vegetation.

1.2.4 Corrective Measures

The Pacific Environmental Group (1998) prepared a Corrective Measures Study report that identified and evaluated corrective measures for the Shell Pond, considering technical feasibility, economic factors, and environmental and human health impacts.

The corrective measures recommended and ultimately selected for the Shell Pond included circulation and discharge of slough water to improve salinity in the Shell Pond, surface discharge monitoring, vegetation monitoring, and levee inspection and maintenance. Salinity in the pond had increased due to lack of circulation and evaporation, which tends to concentrate the salts naturally present in the bay water.

After DTSC approval of the Corrective Measures Study in 2000, PG&E implemented the recommended remedy. This included rebuilding two intake pumps in July 2002 and recirculating water from an adjacent slough into the pond and discharging under an NPDES permit.

Between 2000 and 2008, PG&E intermittently pumped slough water into the southeastern corner of the Shell Pond and discharged water into an adjacent slough at the northwestern corner in accordance with the DTSC's Final Resource Conservation and Recovery Act (RCRA) Corrective Action Remedy Selection Decision (DTSC, 2000). The remedy elements were incorporated into the CA entered into between PG&E and DTSC (DTSC, 2004). Pond water circulation and discharge had been successful at controlling odors and reducing salinity. However, this remedy for the pond is not viable or sustainable over the long term because of the difficulty in complying with all requirements in the NPDES permits (Order No. R2-2006-0010, Permit No. CA0030082 and Order No. R2-2007-0077, Permit No. CA00388949) associated with circulation and discharge of pond water. Since late August 2008, a water cover without circulation and discharge has been maintained on the Shell Pond to minimize odors and dust (*Interim Operation and Maintenance Plan* (ENTRIX, 2008b). Over time, the high evaporation rates at the Shell Pond and the lack of circulation or fresh water inputs will result in an unacceptable increase in salinity in the pond.

2.0 Project Objectives

2.1 Remediation Objectives

PG&E has identified the following long-term objectives for the Shell Pond site:

- Continue to protect human health and the environment
- Restore estuarine habitat compatible with areas to the north and east
- Decrease ongoing costs and operations and maintenance (O&M) requirements for regulatory compliance
- Maintain site as open space consistent with the Contra Costa County General Plan

2.2 Proposed Remediation Goals

Proposed remediation goals for the Shell Pond project are ecological remediation goals (as opposed to human health remediation goals) because the site is in a tidal marsh area, the human health exposure will be limited to recreational users, and ecological remediation goals are appropriate and more stringent compared with human health remediation goals. Proposed remediation goals (ecological preliminary remediation goals [EcoPRGs]) for chemicals detected in the non-native material in the Shell Pond were developed based on review and compilation of:

- Ambient and background concentrations in the project area,
- Ecological screening values and benchmarks, and
- Ecological cleanup goals for other remediation sites in the project area.

Table 2-1 presents the compilation of the above information as potentially applicable to the Shell Pond (all tables are located at the end of this document). Ambient or background values are presented first because they are directly applicable to the project, and in a hierarchical ranking of the above information they are considered to have the highest priority based on confidence in the source and relevance to the Shell Pond site. The ambient background valves are followed by screening values and ecological cleanup goals for other remediation sites in declining order of priority. Project-specific remedial goals are generally considered equivalent to screening values in terms of confidence and relevance. However, values that were area-weighted were not used. The categories/sources of values presented in Table 2-1 are as follows:

Ambient/background values – Ambient/background values were obtained from the following sources:

- PG&E Shell Pond – Inorganic ambient values established by General Chemical Corporation, Bay Point Works (Montgomery Watson, 2000; 2001) and organic ambient values established by the San Francisco Estuary Institute (SFEI, 2008) were cited as being applicable to the Shell Pond in the Environmental Sampling Report prepared by ENTRIX (2009b).

- General Chemical Corporation Bay Point Works - Inorganic ambient values for Chemical Corporation, Bay Point Works (Montgomery Watson 2000, 2001). These are the same as those recommended by ENTRIX. They are presented separately in Table 2-1 to show the primary source of the values.
- San Francisco Estuary and San Pablo Bay/Carquinez Reference sites – Ambient values for sediments collected at these reference sites (RWQCB 2000).

Sediment quality benchmarks – Sediment quality benchmarks are values that have been derived through statistical analysis of data from many sites. A low toxicity and a high toxicity benchmark are usually presented. Some are screening benchmarks for sediments in other countries (Dutch or Canadian). All values are for marine or estuarine conditions and are reported in the open literature. Sediment quality benchmarks were obtained from the following sources:

- San Francisco Regional Water Quality Control Board – Sediment quality criteria for the beneficial reuse of sediments as "Wetland Surface Material" (RWQCB, 2000).
- Effects Range–Low and Effects Range-High sediment quality benchmarks for benthic macroinvertebrates (Long et al., 1995).
- Threshold-20 and Threshold-50 sediment quality benchmarks for benthic macroinvertebrates (Field et al., 2002).
- Threshold Effects Level, Probable Effects Level, Apparent Effects Level, Dutch Target and Dutch Intervention Levels (Buchman, 2008).
- Canadian Environmental Quality Guidelines for sediment (CCME, 2003).
- Apparent Effects Threshold-Low and Apparent Effects Threshold-High from Puget Sound (Barrick et al., 1988).
- Serious Risk Concentrations for ecological receptors (RIVM, 2001).

Project-specific remedial goals – Sites in the San Francisco Bay Area similar to the Shell Pond for which remedial goals had been derived for birds or mammals were also reviewed. Non-area-weighted preliminary remedial goals are listed for analytes and receptors available. These values are not listed in any hierarchical order. They are all considered generally equivalent in quality and confidence level. All values are back-calculated risk-based concentrations for specific bird or mammal receptors assuming a given diet and exposure. Projects reviewed include the following:

- Hunters Point Shipyard – Parcel F (Barajas and Associates, Inc., 2008)
- Naval Weapons Station Seal Beach – Detachment Concord (Tetra Tech, 2008)
- Former Naval Air Station Moffett Field (Tetra Tech, 2009)
- Hamilton Army Airfield – North Antenna Field (CH2M HILL, 2007)

Table 2-2 presents the selection of the most appropriate ecological remediation goals for all the chemicals reported in non-native material in the Shell Pond. The ecological remediation goals include both a Low EcoPRG and a High EcoPRG to provide a risk-based range of remedial goals. The Low EcoPRG is the most conservative value and is considered protective of all potential receptors at the Shell Pond, including any special-status species. Low EcoPRGs are generally ambient or background concentrations or concentrations where no adverse effects would occur. High EcoPRGs are slightly less conservative values, but are still protective of receptors that may use the Shell Pond. High EcoPRGs are typically the lowest concentrations at which some adverse effects may occur, but the overall populations or community structure of the Shell Pond would not be adversely affected. As noted above, the values were selected by reviewing the categories and sources of values in a hierarchical order. The values highlighted yellow in Table 2-1 were considered in selecting the Low EcoPRG with Ambient Concentrations given the highest priority. If an ambient concentration was not available, then the Sediment Quality Benchmarks were reviewed. The High EcoPRG was selected using the same hierarchical order as for the Low EcoPRG. However, there is occasionally overlap in values such that a Low value from one source may be higher than a High value from another source. In selecting the High EcoPRG, the lowest value that was greater than the selected Low EcoPRG was selected. Some examples are given below:

- Arsenic – The Low EcoPRG was selected by reviewing those values highlighted in yellow on Table 2-1. Ambient concentrations were given the highest priority. Since a site-specific ambient concentration was available for arsenic (29 milligrams per kilogram [mg/kg]), it was selected as the Low EcoPRG. The High EcoPRG was selected by reviewing the values highlighted in pink on Table 2-1. The highest priority source is Long et al. (1995). An ER-M value was available for arsenic (70 mg/kg) so it was selected as the High EcoPRG.
- Ethylbenzene – The Low EcoPRG was selected following the hierarchy and using the yellow highlighted values. There are no ambient concentrations for ethylbenzene so sediment quality benchmarks were reviewed. There are no values for ethylbenzene in the highest (Long et al., 1995) or second highest (Field et al., 2002) priority sources. The first source with a low-based value for ethylbenzene is the Dutch Target value (0.03 mg/kg) as presented in Buchman (2008). This value was selected as the Low EcoPRG. The High EcoPRG was selected reviewing the pink-highlighted values. The highest priority source with a high-based value is the apparent affects thresholds (AET) value from Buchman (2008); however, this value (0.004 mg/kg) is less than the selected Low EcoPRG (0.03 mg/kg), so the next available source was reviewed. The source with the lowest value that was greater than the Low EcoPRG was the apparent affects thresholds-high (AET-H) value (0.037 mg/kg) from Barrick et al. (1988).

Table 2–3 provides the proposed remediation goals for the COPCs for the Shell Pond. Only chemicals detected in the non-native material at concentrations above the Low EcoPRGs that exceeded analytical results for the non-native material (CH2M HILL, in progress) are included in Table 2-3. Based on a conservative assessment of applicable EcoPRGs, the proposed remediation goals for Shell Pond are:

- Concentrations of COPCs in sediment in the pond should on average be equal to or less than the Low EcoPRGs shown in Table 2-3, and
- The High EcoPRGs should not be exceeded at any location in the Shell Pond.

2.3 Planned or Potential Future Use

Future planned or potential uses of the site include:

- Transitional upland to wetland habitat at the south end of the Shell Pond.
- Tidal wetland for the majority of the Shell Pond.
- Upland habitat for the Carbon Black Area.
- An East Bay Regional Park District plan to extend the Great California Delta Trail along the south side of the Shell Pond is separate from and predates the planned corrective action for the Shell Pond.
- The Contra Costa County Redevelopment Agency Bay Point Strategic Plan (ESA, 2008) designates the Shell Pond parcel as current and future open space. The plan designation of the parcel to the west for potential residential/commercial use is speculative.

3.0 Summary of Alternatives Considered

There are two primary approaches for closure of solid waste management units (SWMUs):

- Isolate or contain the non-native material by covering the material and preventing direct contact with the material and implementing long-term maintenance monitoring and institutional controls; or
- Remove the non-native material and thus eliminate the SWMU.

This section summarizes the alternatives developed from the above basic approaches. The remedies were developed in order to provide a range of approaches and to compare the advantages, disadvantages, benefits, and costs to the current remedy. The current remedy to maintain a water surface over the pond material is a means to control dust and odors.

The five alternatives identified for evaluation are:

1. No Action/maintain water cap
2. Cover pond material in-place
3. Consolidate removed material onsite in the CBA, restore wetlands
4. Consolidate removed material onsite in the south end of the Shell Pond, restore wetlands in the majority of the Pond
5. Remove material and dispose of offsite, restore wetlands

All alternatives will require safe access to the property, for which an access road is planned from the railroad crossing at the Harris Boat Harbor along the north side of the railroad tracks approximately 4,250 linear feet to the south of Shell Pond. Alternatives 2 through 5 also include removal of non-native material from the former wastewater ditch at the south end of the Carbon Black Area and placement of a small amount of clean fill over portions of the CBA to improve vegetation.

3.1 Technologies Considered

A variety of technologies are potentially suitable to implement the above alternatives.

3.1.1 Cover or Capping

Cover or capping performance and prescriptive standards for SWMUs are set forth for Class II and Class III surface impoundments in 27 CCR Division 2, Subdivision 1 (Title 27). Regulatory requirements provide for flexibility in the design of cover systems. For purposes of this evaluation, two cover or capping options were considered:

- Dewatering the pond and covering the exposed pond bottom with 1 foot of vegetative cover (vegetative cover is soil that is capable of supporting vegetation and typically contains organic material and nutrients, is not compacted and does not constitute a low permeability cover).

- Dewatering the pond and capping the exposed pond bottom by placement of a geogrid with filter fabric, 2-foot-thick foundation layer, a geosynthetic clay liner (GCL) or flexible membrane liner (FML), and 1 foot of vegetative cover.

Neither of these options would meet all prescriptive requirements for cover systems over SWMUs; however, regulatory requirements do allow for such alternatives to be used if it can be demonstrated that the prescriptive requirements are not technologically necessary or feasible and the proposed cover meets the intent of the regulations. Depending on regulatory requirements for an acceptable cover system, restoring Shell Pond to natural mixed wetlands may or may not be possible with an in-place cover. In general, requirements for closure of SWMUs prohibit the ponding of water on the cover system.

3.1.2 Removal

Several technologies for removal were considered including various dredging methods (mechanical, drag-line, and hydraulic) and removal with low-pressure excavation equipment. The following two basic sediment removal methods were selected for this evaluation:

1. Mechanical excavation with land-based equipment
2. Hydraulic removal using water-based equipment

Mechanical excavation could be performed for material in the south end of the Shell Pond where water is typically not deep enough to cover the material and there is little or no soft peat underlying the non-native material. Although the surface is dry, the underlying material is expected to be soft and wet such that stabilization of the material either in-place or prior to loading into trucks will be necessary. Stabilization is generally accomplished by mixing the material with cement or other water-absorbing materials. Excavation equipment would be specialty low-pressure equipment, and mats or other structural support would be necessary to prevent equipment from sinking into the soft material. Odor controls during excavation will likely be necessary once the underlying material is exposed during excavation. Mechanical excavation of the entire pond by allowing water to evaporate and then in-situ stabilization is not likely feasible because of the thickness of soft sediments in the northern portion of the Shell Pond and the proposed schedule.

Other removal technologies can be conducted with the water in the Shell Pond. The technologies that were considered included the use of drag-line, mechanical hydraulic removal using an excavator or clamshell, and hydraulic suction removal. The drag-line method was eliminated as technologically infeasible based on conversations with a local drag-line operator who indicated that a drag-line is not a precise excavation device and could lead to either increases in the amount of material removed or could leave non-native material in-place. Mechanical dredging using an excavator or clamshell was eliminated because of the large surface area and relatively shallow depth of non-native material in the pond. Hydraulic removal was retained as a potentially feasible technology because the material could be pumped into geosynthetic filter tubes (also called Geotubes®) where the sediments would dewater. Hydraulic removal generates large quantities of water (assuming a slurry of 5 to 10 percent solids) and water treatment costs can significantly affect the total cost of the alternative, depending on the type of treatment necessary. The equipment would consist of a horizontal auger that suspends the material and pumps that suction the water and material through pipes to a temporary containment area where the material is dewatered in the Geotubes®.

Bench and pilot scale testing in progress will be used to evaluate the material properties, amount of stabilization materials needed, odor control requirements, and effectiveness of different removal and handling options, as well as the need for treatment of filtrate from dewatering of material. The results of this testing will also allow for refinement of the selection of the removal technologies (hydraulic removal vs. mechanical excavation).

Based on recent investigation (CH2M HILL, in preparation), about 150,000 cubic yards of non-native material are present in the Shell Pond and an estimated 180,000 to 300,000 cubic yards of material may be removed depending on removal equipment and technological limitations. The current baseline estimated quantity for removal is 240,000 cubic yards, which is comprised of 180,000 cubic yards of non-native material and 60,000 cubic yards of additional material to ensure removal of all the non-native material (0.5 feet below the non-native material over 73 acres).

3.1.3 Transport and Disposal of Materials

Two methods were considered for transport of stabilized material to an offsite disposal facility:

- Enclosed/covered rail cars
- Covered trucks

Rail transport can be a preferred method of transport when the material must be disposed of at locations far from the site (out-of-state for example) and where the landfill is accessible by rail. Rail transport has the benefit of minimizing traffic on surface streets and highways near the site, but if trucks are needed to transport the material from the site to the rail loading area or from the rail unloading area to the landfill, this benefit is reduced. The project was discussed with a broker for rail transport, who indicated that rail transport of material from the site would not be cost-effective. Because this material is acceptable for disposal at Keller Canyon Landfill located approximately 5 miles from the site, covered trucks are a feasible and cost-effective method for transport of the material.

3.1.4 Water Management

Management of water was considered in evaluating alternatives. The bench scale and pilot testing that is planned includes evaluation of water quality in order to evaluate the most appropriate methods for management of water. Activities that may produce water and sources of water include:

- Pond dewatering
- Filtrate water from dewatering of hydraulically removed material using Geotubes®
- Precipitation on material handling areas
- Slough water pumped in to maintain sufficient water for hydraulic removal

Pond dewatering would be necessary to cap the pond or perform mechanical removal with land-based equipments. Water generated from this activity would be expected to require settling and/or filtration to remove suspended solids prior to permitted discharge under an NPDES permit, or alternatively, to a publicly-owned treatment plant.

Hydraulic removal requires sufficient water to remove the material by pumping through a pipe into Geotubes® or a dewatering cell. The resulting water that drains from the material (filtrate) could be sent back to the pond and recirculated during the removal process to reduce the amount of slough water that would be needed. Slough water is currently added to the pond during the summer months to maintain the water cover.

The quantity of water and type of water treatment that may be needed can be a significant cost. In general, for similar projects, the water treatment consists of settling and/or filtration to remove suspended solids. The costs for water management and treatment were determined from dewatering costs on similar projects. If treatment for soluble constituents is determined to be necessary, then treatment beyond filtration will be required.

3.1.5 Treatment with No Removal

Technologies considered that would not require removal of non-native material include phytoremediation and stabilization.

Phytoremediation involves plant uptake of chemical constituents to remove COPCs from soil and water. This typically involves periodically removing the plants which have taken up the chemicals. This technology was not retained because continuous removal of plants would not meet the goal of restoring wetland habitat.

Stabilization involves adding agents such as cement to soils or sediment either in situ or ex situ to render constituents less environmentally mobile. Stabilization is generally more effective for metals than organic compounds. This technology (by itself) was not retained for use in the Shell Pond alternative development because in situ treatment leaving the non-native material in the pond could potentially render the area unsuitable for wetlands and wetland habitat.

3.1.6 Tidal Restoration

Tidal restoration design necessitates a collaborative effort with the regulatory agencies identified in Section 5.0, Regulatory Framework, of this document. A conceptual design and design of the tidal restoration phase of the project will occur as part of the project design activities. For this evaluation, the following key cost assumptions were made for tidal restoration in the Shell Pond:

- No import of fill materials or significant grading would be required within the pond.
- The ground surface following material removal would be at an elevation suitable for tidal restoration.
- The quality of surface material following sediment removal will be suitable for natural colonization of wetland flora.

Existing levees would be breached. Planning level estimates of wetland restoration costs are based on the Suisun sub-region per-acre cost of $5,000 published by the San Francisco Bay Habitat Joint Venture.[1]

[1] "Restoring the Estuary," undated document, Chapter 7. Available online: http://www.sfbayjv.org/pdfs/strategy/Restoring_The_Estuary_Full.pdf

3.2 Description of Alternatives

This section presents a general description and key elements of each alternative proposed for the Shell Pond.

All alternatives will require safe access to the property, for which a temporary access road will be created from the railroad crossing at the Harris Yacht Harbor extending east along the north side of the railroad tracks approximately 3,000 linear feet to the Shell Pond and approximately 1,250 feet along the south end of the Shell Pond.

3.2.1 Alternative 1 – No Action/Maintain Water Cap

This alternative, shown in Figure 3-1, is essentially implementation of the approved remedy in the Corrective Action Consent Agreement (CA, Docket HWCA: P2-03-04-006) with the added component of treatment of the surface water discharges. The approved remedy consists of maintaining water in the Shell Pond and providing periodic circulation of the water by pumping water from the slough to the east of the Shell Pond and allowing water to discharge through the existing structure in the northwest corner of the Shell Pond. Discharges from the Shell Pond are permitted by the RWQCB under the following permits: Order R2-2006-010 (NPDES Permit No. CA0030082) and Order R2-2007-007 (NPDES Permit No. CA00388949), Waste Discharge Requirements for Municipal and Industrial Discharges of Mercury to San Francisco Bay. Treatment of this discharge is needed to meet dissolved oxygen, pH and mercury discharge limits. Based on a prior pilot study (AMEC, 2008); the treatment system would consist of the following.

- Feed pumps
- Bag and cartridge filters to remove particulates
- Ion exchange to remove mercury
- Dosing tank for pH adjustment with carbon dioxide
- Cascade aerator to improve dissolved oxygen concentration

Discharges from the Shell Pond were intermittent and historically have been as high as 20.9 million gallons per month (ITSI, 2008).

This alternative includes inspection, operations and maintenance, analysis, and reporting as required by the discharge permits.

3.2.2 Alternative 2 – Cover Pond Material In-Place

This alternative, shown in Figure 3-2, does not disturb or remove any sediment from the pond. The intent of this alternative is to eliminate direct contact of ecological receptors to pond sediment. This will reduce the risk to ecological receptors and mitigate potential exposures of nearby residents to odors and dust.

The elements of this alternative include:

- Allow pond sediments to dry out and temporarily cover them in stages to mitigate potential odors and dust.

- Place geogrid or similar material to allow for access with low-pressure equipment.

- Place a cover of clean fill that can be revegetated with native and potential wetland species.
- Breach levees to allow for tidal restoration with minimal erosion of cover materials.

Two potential cover options were evaluated for this alternative:

- Cover Alternative 2a - cover pond material with 1 foot clean fill (either imported or from the area west of the pond).
- Cover Alternative 2b - cover pond material with a low-permeability cover system consisting of 2 feet of foundation material, an impermeable liner, and 1 foot of vegetative cover.

Cover Alternative 2b is more consistent with prescriptive requirements for closure of non-hazardous SWMUs. However, prescriptive cover systems are generally not suitable where wetlands restoration is desired because wetland areas, by nature, are periodically flooded and prescriptive requirements are intended to eliminate run-on and promote run-off from the covered area.

A prescriptive cover system for the entire 73 acres would not likely be cost-effective because it would require raising the elevation of the Shell Pond area to promote runoff and prevent run-on of surface water, expand the upland area of the parcel, and may require mitigation for the potential loss of wetlands due to cover construction over the Shell Pond. Therefore, a prescriptive cover alternative would not be a feasible alternative.

3.2.3 Alternative 3 – Consolidate Removed Material from the Shell Pond Onsite at Carbon Black Area

Consolidation of material excavated from the Shell Pond on the adjacent 22-acre CBA is shown on Figure 3-3. This alternative would allow for tidal restoration to take place in the pond, but grades in the area of consolidation would be raised. The major elements of this alternative consist of the following:

- Grub and clear vegetation in the approximately 22-acre CBA.
- Remove approximately 240,000 in-situ cubic yards of material from the Shell Pond by a combination of mechanical excavation and hydraulic removal. The in-situ cubic yards include 180,000 cubic yards of non-native material (material that exceeds proposed remediation goals) and 60,000 yards of underlying material (approximately 6 inches below the non-native material).
- Construct a containment area for pumping of the material into Geotubes®.
- Perform some treatment of water from dewatering of removed material.
- Place and compact the mechanically excavated material (estimated 31,000 cubic yards) from the south end of the pond and excavated material (estimated 300 to 600 cubic yards) from the former waste water ditch around and in between the Geotubes®.
- Place 1 foot of vegetative cover (import or borrow from west of pond) or placement of a GCL and 1 foot of vegetative cover.

- Grade the area to promote run-off.
- Construct drainage controls to prevent run-on.
- Restore the Shell Pond Area to promote tidal habitat and transition to upland habitat (these activities will include breaching of levees around the pond).
- Provide long-term inspection and maintenance to maintain cover system.
- Provide institutional controls and deed restriction for consolidation area.

This alternative would raise the elevation in the CBA approximately 4 to 8 feet depending on the reduction of volume resulting from material dewatering.

3.2.4 Alternative 4 – Consolidate Removed Material from the Shell Pond in Southern End of the Shell Pond

This alternative, shown in Figure 3-4, involves removing sediments from the northern portion of the Shell Pond and consolidating them in the southernmost 8 acres of the pond (also extending over approximately 4 acres outside the south end of the pond) for a total of 12 acres. This consolidation area would become upland habitat with an approximate increase in elevation of 6 to 10 feet. This alternative includes the following elements:

- Grade and construct an area (approximately 12 acres at south end of pond) for placement and dewatering of Geotubes®.
- Remove an estimated 209,000 cubic yards of material from the northern 65 acres (73 acres minus 8 acres) within the Shell Pond by hydraulic horizontal auger dredge.
- Pump the material into Geotubes® and allow filtrate to flow into northern portion of the pond.
- Treat water from dewatering as required for NPDES or discharge to a publicly owned treatment plant.
- Place and compact the excavated material (estimated 300 to 600 cubic yards) from the former wastewater ditch around and in between the Geotubes®.
- Place 1 foot of vegetative cover or placement of a GCL and 1 foot of vegetative cover over sediment.
- Restore the 65-acres in the northern portion of the Shell Pond area to promote tidal habitat and transition to upland habitat (these activities will include breaching levees around the pond).
- Provide long-term inspection and maintenance to maintain cover system.
- Provide institutional controls and deed restriction for consolidation area.

3.2.5 Alternative 5 – Remove Sediment and Dispose Offsite

Alternative 5 is illustrated in Figure 3-5. The intent of this alternative is to remove non-native material from the Shell Pond, eliminate the SWMU and associated regulatory requirements, and eliminate long-term monitoring and maintenance of the pond. Short-term maintenance and monitoring may still be required to demonstrate successful habitat restoration.

The major elements of this alternative are as follows:

- Remove a total estimated 240,000 cubic yards of sediment within the Shell Pond by either mechanical excavation or hydraulic dredging. Cost estimate assumes approximately 209,000 cubic yards are removed hydraulically and 31,000 cubic yards are mechanically excavated. Figure 3-6 illustrates the conceptual removal plan.
- Construct up to approximately 20-acre containment area for dewatering of hydraulically removed material. Treat water from dewatering as required.
- Transport an estimated 300,000 tons of material to Keller Canyon Landfill, a Class II-permitted disposal facility located approximately 5 miles from the site, for disposal. This assumes approximately 1.25 tons per cubic yard of material (including stabilization material).
- Restore the Shell Pond to promote tidal habitat and transition to upland habitat (these activities will include breaching levees around the pond).

3.3 Evaluation of Alternatives

3.3.1 Evaluation Criteria

Alternatives were evaluated based on RCRA Corrective Action evaluation criteria (USEPA, 2000):

1. Protect human health and the environment
2. Attain media-specific cleanup standards
3. Control sources of releases
4. Comply with standards for management of wastes
5. Long-term effectiveness and permanence
6. Reduction of toxicity, mobility, and volume through treatment
7. Short-term effectiveness
8. Implementability

Table 3-1 summarizes the results of this evaluation. The range in costs shown in Table 3-1 includes analysis of cost uncertainties such as removal quantity, transportation and disposal costs, and consolidation area. More details on costs and cost assumptions are included in Appendix B.

3.3.2 Evaluation Results

Alternative 1 – No Action/Maintain Water Cap is most easily implemented because it is already approved. It would have the lowest capital but highest O&M costs associated with operation of the water treatment system.

Alternative 2 – Cover Pond Material in Place involves covering the non-native material in the Shell Pond with a soil cap rather than a water cap to control dust and odors. It would require import of fill which could generate local truck traffic. Depending on the type of cover (either 1 foot of soil or 3 feet of soil and a geomembrane), it could reduce the amount of wetland area and require mitigation.

Alternative 3 – Consolidate Removed Material from Shell Pond Onsite at Carbon Black Area involves excavating, consolidating, and covering removed non-native material in the CBA. This alternative would allow the entire area of the Shell Pond to be restored as mixed tidal and wetland habitat. The elevation of the CBA would be raised and provide upland habitat. Inspection, maintenance and institutional controls would still be applicable to the CBA. Use of the Carbon Black Area for consolidation would provide the vegetative material to allow for vegetation included as an enhancement for the CBA in Alternatives 4 and 5.

Alternative 4 – Consolidate Removed Materials from the Shell Pond in the Southern End of the Shell Pond involves removing non-native materials in an estimated 90% of the Shell Pond to be restored as a tidal habitat and consolidating the removed material in the southern approximately 10% of the pond. The southern portion of the Shell Pond would be upland. This alternative has relatively similar capital and O&M costs compared to Alternative 3. Like Alternative 2, import of soil for construction of cover and capping for alternatives 3 and 4 would result in short-term truck traffic.

Alternative 5- Remove Material and Dispose Offsite would involve removing material from the pond and disposing of it at a permitted offsite facility (Keller Canyon Landfill). This would allow the pond to be restored as a mixed tidal and wetland habitat. It would generate significant local short-term truck traffic and would have the highest cost relative to other alternatives.

4.0 Proposed Shell Pond Final Remedy

The proposed final remedy for the Shell Pond is Alternative 5 - Remove non-native material from the Shell Pond, dispose of the material offsite at a permitted landfill and breach the existing Shell Pond levee to allow for the area to become a self-sustaining tidal wetland (Figure 3-4). In conjunction with implementation of the proposed alternative remedy, additional construction activities are proposed: 1) construct an access road and bridge from the railroad crossing at Harris Yacht Harbor east to the Shell Pond; 2) apply soil cover and seed to unvegetated areas of the Carbon Black Area and 3) remove non-native material from the former industrial wastewater ditch and dispose of this material along with material removed as part of the proposed alternative remedy (Figure 4-1).

Implementation of the proposed final remedy for the Shell Pond will include:

- Regulatory and resources agency permitting as described in Section 5.0;
- Public participation as described in the Public Participation Plan approved by DTSC;
- Remediation construction activities as described below; and
- Protective measures to mitigate potential impacts of the remedial construction pursuant to CEQA as described below and summarized in Table 4-1.

The project schedule includes phasing of the construction activities so that the majority of construction activities can be completed by the end of 2011. This phasing is possible because not all proposed activities require permitting and approval of all agencies, although all activities require completion of the CEQA documentation. The resources agencies will be involved throughout the processes of design, permitting and construction. Implementation of the Public Participation Plan submitted and approved by DTSC will also be a key element of this project.

The following sections describe the key elements of the remedy plan and proposed measures to reduce potential project impacts under CEQA. Elements of the proposed remedy may change based on multiple factors including:

- Results of bench and pilot tests, and supplemental topographic surveys and biological surveys
- Regulatory and resource agency input and permit conditions
- Community input
- Design considerations
- Construction cost estimates
- Schedule

4.1 Phase 1 — Access Road and Materials Handling Construction Activities

Proposed Phase 1 activities consist of construction of the access road with bridge and materials handling area. These activities will occur outside of wetlands and the jurisdiction of the U.S. Army Corps of Engineers (USACE) and the Bay Conservation and Development Commission (BCDC); therefore permits from these agencies are not required. These activities require local county permits for grading and bridge construction and CEQA documentation.

Planned measures to minimize the impacts of the Phase 1 construction activities include:

- Avoidance of biologically sensitive habitats
- Use of low noise equipment
- Implementation of best management practices for dust control and air pollutant emissions including but not limited to controlling idling time, properly tuning engines, use of electric equipment where feasible.

Phase 1 activities would include the tasks described in the subsections below.

4.1.1 Preparation of Project Plans and Mobilization

The following project plans will be prepared and followed as part of the design and implementation of the proposed remedy project.

- Transportation/Traffic Control Plan
- Spill Prevention, Control and Countermeasures (SPCC) Plan
- Emergency Response Plan
- Stormwater Pollution Prevention Plan (SWPPP)
- Dust Control Plan

As part of mobilization of construction equipment and facilities to the site, biological barriers and exclusion areas will be set up, pre-construction biological surveys will be performed as appropriate and site specific construction worker training will be conducted for health and safety, emergency response and any special requirements to mitigate any project impacts.

4.1.2 Construction of the Temporary Access Road and Bridge

Approximately 4,250 linear feet of access road will be needed. The access road will connect to the existing road on the north side of the railroad track at Harris Yacht Harbor (southwest corner of PG&E owned property) and extend east to the eastern edge of the Shell Pond. A temporary bridge founded on spread footings will span the existing unlined stormwater ditch that flows from south of the railroad track into the slough/channel on the west side of the Shell pond. The temporary access road will be constructed by grading the proposed road alignment, placing geotextile to provide a barrier between the aggregate base and underlying material and placing approximately 12 to 15 inches of aggregate base sufficient to support haul trucks. Design of the temporary bridge and road is in progress and appropriate local permits will be obtained.

4.1.3 Construction of Staging and/or Materials Handling Area

Areas identified for potential construction staging and materials handling include portions of the approximately 37 acres of upland to the west of the Shell Pond, approximately 4-5 acres south of the Shell Pond and the approximately 22-acre CBA east of the Shell Pond. Approximately 12 to 22 acres may be needed for materials handling and dewatering. The upland area to the west of Shell Pond could serve multiple potential uses including for staging of materials and equipment, as a potential materials handling area for the Geotubes® and as a source of fill material for the CBA. The area for temporary containment of Geotubes® (approximately 20 acres) will require grading, placement of an impermeable geomembrane and berms to manage filtrate from the dewatering of the hydraulically removed material. The materials handling areas will also be the location of loading and hauling for offsite disposal of the non-native material. If the CBA is selected as the preferred materials handling area for the Geotubes®, then construction of the hydraulic materials handling area will not occur until wetland delineation and any necessary USACE permits or permissions are received.

4.2 Phase 2 —Shell Pond and Discharge Ditch Material Removal and Carbon Black Area Fill Placement

Phase 2 activities are dependent on receipt of permissions and permits from resource and regulatory agencies as described in Section 5.0 of this report. In addition, the schedule for these activities may be affected if planned bird surveys indicate the presence of California clapper rail in the site vicinity.

As summary of project impacts as evaluated in accordance with CEQA and planned measures to minimize the impacts of the Phase 2 construction activities are presented in Table 4-1. Proposed measures to minimize impacts include:

- Avoidance of biologically sensitive habitats and performance of work outside of buffer areas and species windows
- Use of low noise equipment
- Use of odor control technologies and best management practices to control odors
- Division of construction activities to reduce daily air pollutant emissions
- Implementation of best management practices for dust control and air pollutant emissions
- Traffic control plan to reduce traffic impacts on public roadways

Phase 2 would consist of four primary tasks, as described below.

4.2.1 Preparation of Plans and Mobilization

Additional construction plan documents in addition to potential revisions to the Phase 1 Plans are expected to include an odor control plan, noise control plan, excavation and disposal plan and health and safety plan that includes water safety. Similar to Phase 1, pre-construction biological surveys and worker information and training would be performed as part of mobilization activities for Phase 2.

4.2.2 Removal of Non-native Material in Shell Pond

The non-native material in the Shell Pond and the wastewater ditch is proposed for removal. The volume of material to be removed is currently estimated to be 240,000 cubic yards. This estimate is based on 180,000 cubic yards of in-situ non-native material (see Figure 3-5) plus an additional 60,000 cubic yards (6 inches below non-native material over 73 acres) of removal to account for equipment removal inaccuracy. For project planning, an additional 60,000 CY (300,000 CY total) of material was assumed for removal if proposed remediation goals are not achieved in all areas. The range of costs in Table 3-1 includes consideration of quantity estimates up to 300,000 in-situ cubic yards of material. Currently two technologies are anticipated for removal of non-native material: mechanical excavation using conventional land-based equipment and hydraulic removal using horizontal auger dredges that pump material to Geotubes® in the material handling area. The results of bench and pilot testing will be incorporated into the project design and may lead to changes or refinements in the removal approach.

4.2.2.1 Mechanical Excavation and Offsite Disposal

Mechanical excavation would occur in the south end of the pond (approximately 6 to 12 acres) where there is insufficient water to hydraulically remove the non-native material. Currently, an estimated 31,000 cubic yards of material (approximately 10 to 15%) over 8 acres will be removed by mechanical excavation. Mats such as wood or aluminum landing mats would be placed over the non-native material to allow excavators to access the material. It is anticipated that the material will be saturated and at least some of the material will require stabilization (either in-place or ex-situ) to pass the paint filter test as required for landfill acceptance. Based on results of the pilot test, the material may be stabilized in-place with cement or a similar material and then excavated. Alternatively, the material may be excavated and then stabilized prior to loading into haul trucks. If ex-situ stabilization is the most efficient and feasible method of stabilizing the removed material then a material handling area may be constructed at the south end of the pond. The two excavators would be able to remove and load approximately 600 cubic yards of material per shift. Mechanical excavation would be performed during daylight hours only. During the nesting season, the equipment would be located at least 500 feet from the closest area considered suitable for California clapper rail breeding season. It is anticipated that the mechanically removed and stabilized material would be suitable for direct off-haul. Following stabilization, the material would be transferred to haul trucks with a capacity of approximately 20 tons each. The trucks will be covered and transport the material to Keller Canyon Landfill located approximately 5 miles southeast of the Shell Pond. Material classification and waste acceptance would be conducted and received prior to off-haul. Noise, odor and dust will be controlled during removal as specified in the Construction Plan documents that will be prepared. Odor control is expected to include use of special products (aqueous-based surfactants) that reduce the odors associated with the non-native material. Because the material will be wet, dust should not be an issue. If the stabilizing amendments are applied dry then dust suppression by applying a water spray over the area during mixing may be necessary.

4.2.2.2 Hydraulic Removal and Dewatering

Hydraulic removal is proposed for an estimated 65 acres in the northern portion of the Pond, where water covers the non-native material. An estimated 209,000 to 269,000 cubic yards of in-situ material would be removed hydraulically. Hydraulic removal requires that pond water and in situ material be mixed to create a slurry that contains approximately 5 to 10% solids. The material would be removed using two auger type dredges operating simultaneously. (Figure 4-2 includes a picture of an auger dredge). These two dredges would excavate approximately 1,200 to 1,500 cubic yards of material per day for each dredge. The hydraulic dredging operation is proposed to occur 24 hours a day, 7 days a week, because continuous operation provides the highest removal efficiency and the material could be removed in a shorter period of time. The ability to perform dredging round the clock will depend on the conditions of the resource permits and the ability to demonstrate that noise and light will have no significant impact on sensitive species and the residents that are more than 1,000 feet away from the project site. The dredges would generate higher than ambient noise levels during nighttime hours. The pipe from the dredges would transfer the material to the material handling area where the material would be mixed with a polymer additive (such as TAG 1102) in a surge tank and pumped into the geotextile tubes. Figure 4-2 shows a picture of a Geotube® dewatering setup. The polymer additive is a flocculant that causes the solid particles to bind together and release the water more quickly. Similar flocculants are used in water treatment plants to remove solids prior to sending the water to consumers. Bench and pilot testing that is in progress will be used to test and select the appropriate polymer for the removed material. The polymer selected will not be expected to adversely impact water quality and testing will performed as required to allow the filtrate to be returned to pond during removal activities. Additional water may be required to implement hydraulic removal operations. If addition of water is needed, then water may be pumped from the west slough at rates similar to those currently used to maintain the water cover over the non-native material.

The Geotubes® would be located in a membrane-lined and bermed containment cell equipped with a filtrate collection system and/or sump. Pipes would be manifolded such that multiple Geotubes® can be filled and more material can be added as the water drains from the Geotubes® during the filling operation. The Geotubes® are stacked in the handling area and the weight of the tubes forces additional water from the underlying Geotubes®. The rate and quantity of water that drains from the material in the Geotubes® depends on many conditions. The water from the Geotubes® (filtrate) would be returned via a pipe to the pond and effectively recirculated to allow for hydraulic removal of the remaining material. It is anticipated that the material in the Geotubes® will be suitable for loading and offsite disposal 2 to 6 months after filling. During loading it may be necessary to add cement to stabilize some of the wetter material in the center of the Geotube®.

4.2.2.3 Wastewater Ditch Non-Native Material Removal

Excavation of the wastewater ditch at the southern end of the site would occur with some of the same equipment used for mechanical excavation at the southern end of the Shell Pond.

Based on previous sampling and analysis results (ENTRIX, 2009), approximately 300-600 in-situ cubic yards of non-native material (soil that exceeds proposed cleanup level goals) will be removed from the former wastewater ditch. Material removed from the ditch is not anticipated to require stabilization if the removal activity occurs before the 2011 rainy season. If stabilization is necessary, it will be performed using the same procedures and controls used for removal of material from the south end of the Shell Pond. The abandoned pipe that formed part of the former wastewater conveyance system would also be removed at this time, and disposed of at an appropriate landfill. Clean fill would be placed into the wastewater ditch to bring it back to pre-excavation elevations. Excavation of the wastewater ditch will likely result in a temporary affect to freshwater wetlands within the ditch but the area will be restored in accordance with plans developed in coordination with the resource agencies.

4.2.2.4 Wastewater Management

Wastewater would be generated from a variety of activities during the implementation of the Remedy Project. The majority of the water would consist of filtrate (seepage) from the geotextile bags during hydraulic excavation and dewatering. Some water could also be generated from ex situ mixing of the material removed during mechanical excavation. Small quantities of wastewater would be generated from wash down of the construction equipment. All water generated during the project would be returned to the Shell Pond if feasible based on bench and pilot test results. Filtrate water from the dewatering of the material removed from the pond would be piped and circulated back to the Shell Pond. Any water that is not suitable for return to the Shell Pond based on the pilot and bench test results would be treated prior to discharge, or if large volumes of water require treatment then removal methods may be revised to minimize the amount of water requiring treatment.

4.2.2.5 Confirmation Sampling and Analysis

To demonstrate that the remediation goals have been met, confirmation samples of the material at the new surface of the Shell Pond will be collected at a frequency approved by the regulatory and resource agencies. The samples would be analyzed by a state certified laboratory for the COPCs. These samples may be collected as each area is completed or at the completion of the entire removal project. The material removal would not be considered complete until confirmation sampling results indicate chemical concentrations less than the proposed remediation goals that are approved by DTSC.

4.2.3 Transportation and Disposal

All removed material will be loaded into haul trucks for offsite disposal. Based on existing data regarding chemical quality, the material is anticipated to meet acceptance criteria for disposal at a Class II landfill. Keller Canyon is the nearest Class II landfill. Based on waste acceptance criteria and volume it is expected that the facility would be able to accept the dewatered and stabilized material for disposal.

Keller Canyon Landfill located on Bailey Road, approximately 5 miles southeast of the site. There are three potential truck routes from the site to the landfill. One is to leave the site via the temporary access road and travel south on Port Chicago Highway to Highway 4, proceed east on Highway 4 to the Bailey Road exit, and south on Bailey Road to the Keller

Canyon landfill in Contra Costa County. The other two alternate routes are use Willow Pass Road east to Bailey Road south or Willow Pass Road to Leland Road (south of Highway 4) and east to Bailey Road south. The total one-way travel distance for the primary route and both alternative routes is approximately 5 miles. The haul trucks have a capacity of approximately 20 tons, and the estimated material for offsite disposal is expected to range between 225,000 tons and 375,000 tons (assuming approximately 1.25 tons per cubic yard of in-situ material). The estimate number of truck trips is between 11,250 and 18,750.

Transport of removed material would be scheduled to ensure that air emissions remain below thresholds of significance and minimize traffic congestions during peak periods. Based on the current proposed thresholds of significance (Bay Area Air Quality Management District [BAAQMD], May 2010), a limit of approximately 75 trucks per day could be used to transport material from the site to the landfill. Transportation of removed material would take 150 to 250 days.

4.2.4 Carbon Black Area Fill and Seeding

The CBA is an approximately 22-acre area that was used to dispose of waste materials before the Shell Pond came into use. Carbon black material is present throughout most of the CBA. The CBA is identified by DTSC as a solid waste management unit. Investigations, monitoring and removal actions and additional investigations indicate that the CBA does not pose an unacceptable risk to human health (MSE, 2008a), and the CA did not require further action with the exception of a revegetation plan and institutional controls restricting future use. The CBA consists of a mix of wetland and upland areas, and portions of the area lack vegetation. At the time the initial study was developed it was estimated that 10 to 22 acres of the CBA would be enhanced. Based on a site visit, wetland delineation and review of aerial photographs, the proposed CBA activities as described in the US Army Corps of Engineers Pre-Construction Notification for a 404 Nationwide permit includes placement of an approximately 1-foot layer of soil in unvegetated upland areas (approximate 3 to 4 acres) and seeding the bare, upland areas and bare wetland areas (approximately 2 acres) with an approved native seed mix. An estimated total of 5 to 6 acres of the CBA would be seeded. The source of proposed fill material is the PG&E parcel west of the Shell Pond. The actual extent of activities will be determined based on discussions with DTSC and the resource agencies. A monitoring and an adaptive management program will be prepared and implemented in addition to the requirements for institutional controls/land use covenant prohibiting residential use of the Shell Pond and the CBA.

4.3 Phase 3 — Restoration of Tidal Action to the Shell Pond

Implementation of the proposed remedy would restore the Shell Pond to a self-sustaining combination of upland habitat and estuarine tidal habitat with minimal maintenance requirements. Restoration of the Shell Pond would result in a mosaic of tidal habitats, which is anticipated to include open water, intertidal mudflat, and tidal marsh, and may include some upland habitat on portions of the existing levees. Tidal marsh areas would be expected to vegetate from natural recruitment of species such as cattails, bulrushes, salt grass, and pickleweed and other native species, and inhabited by shore birds, mammals, and other life typically found at the margins of the San Francisco Bay and Suisun Bay and in the estuarine environment. Bathymetric and topographic elevation maps are being developed as part of the project design. The current projected elevations of the pond after removal of the non-native material are between 2 to 4.5 feet NAVD88. The mix of habitat will be based on the post-project elevations and tidal information.

Restoration of the Shell Pond would consist primarily of breaching the levee of the Shell Pond in one or more locations to facilitate tidal water exchange between the Pond area and the surrounding wetlands. The approach to the restoration of the Shell Pond will be based on the results of bathymetric and topographic surveys, post-removal elevations and preliminary hydraulic modeling of tidal flow. The Shell Pond levee will not be breached until DTSC concurs that the confirmation sampling results indicate that the remediation goals were met. The Shell Pond Restoration Plan will be developed in coordination with the resource agencies (USFWS, National Marine Fisheries Service [NMFS], RWQCB, and CDFG and with the Contra Costa County Mosquito and Vector Control District) as applicable and appropriate.

Breaching of the levees will be timed to minimize potential adverse effects to sensitive species. Restoration may also include some regrading of the Shell Pond bottom to achieve the elevation ranges to support a mix of habitats. Portions of the levees surrounding the Shell Pond may be graded down to approximately the mean high water level to create an immediate opportunity for colonization of high marsh vegetation. Soil removed from the levees may be placed on the inside of the levees to create transitional (ecotone) habitat, or removed and placed as part of cover in the Carbon Black Area.

Until the post-removal Shell Pond depths are available after removal of the non-native material, the desired habitat mix and the design of the restoration cannot be finalized. Design considerations will include the following:

- Anticipated tidal prism, bathymetry, and hydraulics,
- Invasive species,
- Potential temporary impacts to listed species habitat, and
- Minimization of maintenance requirements.

Based on preliminary information on bathymetry and tidal ranges, it is anticipated that no import of fill materials or significant grading will be required to achieve the desired habitat mix. It is assumed that the quality of surface material following removal will be suitable for natural colonization of wetland flora, and existing levees will be breached.

The post-removal habitat mix for the restoration component will depend on the post-removal bottom elevations of the Shell Pond and local hydrologic conditions. It is estimated that an average of 2 feet of material will be removed from the Shell Pond; however non-native material thicknesses across the Shell Pond are variable and the post-removal bottom depth of the Shell Pond is expected to be variable. The final stage-storage relationship for the Shell Pond will depend on the amount of material removed, and the conveyance capacities of the adjacent sloughs. More significant grading or excavation will increase the storage capacity and the tidal prism further.

Sediment in the Shell Pond will be allowed to settle prior to breaching the levees to minimize turbidity. The levee breaching will be sized and other measures taken to minimize the accretion of sediment into adjacent channels. Over time the sediment accretion will achieve equilibrium.

5.0 Regulatory Framework

The location of the Shell Pond site, site conditions, and historical use and discharge of hazardous constituents result in a number of regulatory agencies that have jurisdiction and interest in the remediation, restoration and closure of the Shell Pond site. The following is a list of agencies and their roles. Table 5-1 summarizes the permits and permit approvals relevant to the project.

- DTSC – Lead regulatory agency for all site activities including investigations, design, closure, CEQA process, and final closure approval for SWMUs
- RWQCB – NPDES permit, Section 401 Clean Water Act Certification, and authority for maintaining the water quality in the State
- USACE, San Francisco District – Clean Water Act Section 404 permit for dredging or removal of sediments and placement of fill within waters of the U.S., including wetlands, as part of the Section 404 process the USACE consults with USFWS
- USFWS – protection of federally listed endangered species, under Section 7 of the federal Endangered Species Act of 1973 (ESA)
- NMFS – Consultation for protection of federally listed migratory fish species under the federal ESA and essential fish habitat for commercial species (Magnuson-Stevens Act, salmon, steelhead)
- CDFG – Protection of California species listed under the California Endangered Species Act and Fully Protected Species and for development of Section 1602 Lake or Streambed Alteration Agreement
- BCDC – Protection of areas around San Francisco Bay, including habitat, special-status species issues, and public access
- BAAQMD – Notification and permitting for projects that may result in releases of hazardous constituents to air include particulates (dust control)
- Contra Costa County – Local agency approval of projects, grading permits, surface water controls, drainage, and geotechnical considerations
- Mosquito Abatement District – Consultation for restoration elements as they affect control of mosquitoes

The interaction between these agencies and their associated regulations is illustrated in Figure 5-1. Interaction with many of the agencies above has begun as part of the pre-design surveys and surveys necessary to prepare the Initial Study and upcoming agency permits and approvals.

6.0 Schedule of Future Activities

Table 6-1 shows the projected schedule for the Shell Pond remediation, restoration and closure. After permits are obtained from resource agencies, the remediation and restoration can be implemented. This may include preparing final contract documents, procuring construction contractors, and mobilizing personnel and equipment. Anticipated future activities are listed below.

- **Pilot testing and treatability studies** will be performed to evaluate current pond material conditions and select effective and implementable removal and dewatering technologies. A work plan for treatability studies was prepared and provided to DTSC.
- **Modification of the CA** will require DTSC approvals of the proposed corrective action plan.
- **Conceptual design** of the approved corrective action will be submitted to DTSC.
- **Permitting**, as discussed in Section 5.0 of this document, is required from multiple agencies. Permit applications will include conceptual design documents, biological surveys, and a wetland delineation report.
- **CEQA compliance** will include preparation of a Public Participation Plan, fact sheets, public meeting, and initial study.
- **Final plans and specifications** and a construction work plan will be prepared, including a schedule, QA/QC plan, SWWP, health and safety requirements, material transportation plan, air quality control plan, and biological resources protection measures plan.
- A **construction completion report**, summarizing construction activities and including any additional testing or modifications to the original design documents will be prepared.
- A **corrective measure completion report** will be prepared summarizing significant activities, volumes of sediment removed, and disposition of sediments.
- **Habitat restoration reporting** is typically conducted under USACE oversight; this documents the success of the restoration.

7.0 References

AMEC. 2008. *Technical Memorandum, Shell Pond Treatment System Plot Study – Draft*. December 16, 2008.

Barajas and Associates, Inc. 2008. Feasibility study report for Parcel F, Hunters Point Shipyard, San Francisco, California. BAI.5106.0004.0003. April.

Barrick, R., S. Becker, L. Brown, H. Beller, and R. Pastorok. 1988. Sediment quality values refinement: 1988 update and evaluation of Puget Sound AET. Vol. 1. Prepared for the Puget Sound Estuary Program, Office of Puget Sound. Values used as cited in EPA 1997.

Bay Area Air Quality Management District (BAAQMD). 2010.California Environmental Quality Act Air Quality Guidelines, June.

Brown and Caldwell. 1983. *Industrial Waste Pond Site, West Pittsburg, CA – Phase 1 Report, Site Characterization*. August.

Buchman, M.F. 2008. NOAA Screening Quick Reference Tables NOAA OR&R Report 08-1, Seattle, WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 p.

California Department of Toxic Substances Control (DTSC). 2000. Approval of RCRA Corrective Action Remedy Selection for Pacific Gas and Electric Shell Pond and Carbon Pile Property and Class 2 Permit Modification, Southern Energy Delta, LLC, Pittsburg, California EPA I.D. NO CAT 080011695. September 1, 2000

_______. 2004. Corrective Action Consent Agreement, Docket HWCA: P2-03/04-006, Pacific Gas and Electric Company Shell Pond and Carbon Pile Property, 696 West 10th Street Pittsburg, California. Rev January 8.

_______. 2007. *Corrective Measures Implementation at PG&E, 696 West 10th Street, Bay Point (Pittsburg), California, 94595* (EPA ID# CAT 080 011 695). December 27.

_______. 2010. Personal communication from Tony Natera. January 20.

Canadian Council of Ministers of the Environment (CCME). 2003. Canadian Environmental Quality Guidelines, Summary Table: Summary of Existing Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment, Winnipeg. December.

CH2M HILL. In preparation. Shell Pond Investigation Report (working title).

_______. 2010. Shell Pond Remedy Project Initial Study. California Environmental Quality Act Initial Study for the Shell Pond Remedy Project, Bay Point, CA.

_______. 2007. Technical Memorandum, Focused Feasibility Study, Human Health and Ecological Risk Assessment, Hamilton Army Airfield, North Antenna Field, California. April.

ENTRIX. 2006. *An Analysis of the Distribution and Geographic Extent of Waters of the U.S., Including Wetlands at the Shell Pond Project Site, Bay Point, California*, Final Draft. September 29.

_______. 2007. *Biological Resources Assessment for Shell Pond, Bay Point, California. Final Report*, February 16.

_______. 2008a. *Final Sediment and Soil Characterization, Shell Pond, Bay Point, California*. January.

_______. 2008b. *Interim Operation and Maintenance Plan, Shell Pond, Bay Point, California*. October 30.

_______. 2009a. Protection Measures for Special-Status-Species, Shell Pond, Bay Point, California. Prepared for Pacific Gas and Electric Company. January.

_______. 2009b. 2009 Environmental Sampling Report, Shell Pond Site, Bay Point, CA - Final. Prepared for Pacific Gas and Electric Company. June.

_______. 2009c. Screening Level Ecological Risk Assessment, Shell Pond, Bay Point, California. Prepared for Pacific Gas and Electric Company. June.

_______. 2009d. *Framework for Shell Pond Restoration*, *Bay Point, California.* June 2009.

ESA. 2008. *Bay Point Waterfront Strategic Plan Final Environmental Impact Report. State Clearinghouse No. 200 409 2009.* December.

Field, L.J., D,D. MacDonald, S.B Norton, C.G. Ingersoll, C.G. Severn, D. Smorong, and R. Lindskoog. 2002. Predicting amphipod toxicity from sediment chemistry using logistic regression models. Environ. Toxicol. Chem. 21:1993-2005.

Gas Research Institute. 1987. *Management of Manufactured Gas Plant Sites Vol 1 - Wastes and Chemicals of Interest.* October.

ITSI. 2008. *NPDES 2007 Annual Self-Monitoring Report, Shell Pond, Bay Point, California*. January 30.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manage. 19: 81-97

Montgomery Watson. 2000. *Technical Memorandum Background Metal Concentrations in Soil, General Chemical Corporation Bay Point Works Facility, Pittsburg, Ca*. May 15, 2000.

_______. 2001. Addendum to Technical Memorandum, Background Metal Concentrations in Soil. General Chemical Corporation, Bay Point Works Facility, Pittsburg, CA.

MSE Group. 2007. *Groundwater Evaluation Report (Including 2006 Annual Groundwater Monitoring Report for Corrective Measures Implementation)*. May 9.

_______. 2008a. *Cyanide and Cobalt Characterizations and Evaluation in Carbon Black Area Soils*. May 5.

_______. 2008b. *Health Risk Assessment Addendum, PG&E Shell Pond, Bay Point, California*. November 11.

Pacific Environmental Group (PEG). 1998. *Corrective Measures Study report, Shell/PG&E Pond, Carbon Black Area and Former Wastewater Pond. Bay Point, CA.* December 31.

Philip Williams & Associates. 2004. Design Guidelines for Tidal Wetland Restoration in San Francisco Bay. Prepared for the Bay Institute, December 29, 2004.

RIVM. 2001. Rijksinstituut Voor Volksgezondheid en Milieu (National Institute of Public Health and the Environment). RIVM Report 7111701 023. Technical evaluation of the intervention values for soil/sediment and groundwater: Human and ecotoxicological risk assessment derivation of risk limits for soil, aquatic sediment, and groundwater. February.

San Francisco Bay Joint Venture. *Restoring the Estuary: A Strategic Plan for the Restoration of Wetlands and Wildlife in the San Francisco Bay Area*, San Francisco Bay Joint Venture. http://www.sfbayjv.org/pdfs/strategy/Restoring_The_Estuary_Full.pdf, Chapter 7.

San Francisco Bay Regional Water Quality Control Board (RWQCB). 2000. *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines.* Draft Staff Report. May.

_______. 2006. Final Order No. R2-2006-0010, Pacific Gas and Electric Company, PG&E Shell Pond, Contra Costa County, NPDES No. CA0030082. February 8

_______. 2007. Order R2-2007-007 (NPDES Permit No. CA00388949), Waste Discharge Requirements for Municipal and Industrial Discharges of Mercury to San Francisco Bay.

San Francisco Estuary Institute (SFEI). 2008. *The 2007 RMP Annual Monitoring Results*. The Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP), SFEI Contribution No. 272, San Francisco Estuary Institute, Oakland, CA.

Shaw Environmental, Inc. 2006. *Annual Groundwater Monitoring Report for Corrective Measures Implementation*. February 20.

Tetra Tech EM Inc. 2008. Final Supplemental Feasibility Study Report for Litigation Area Site 32 (Unit 7 Mosquito Abatement Ditches) 33 (Units 10 and 11, Lost Slough), and 34 (Nichols Creek Erosional Areas). Naval Weapons Station Seal Beach, Detachment Concord, Concord, California. Prepared for Naval Facilities Engineering Command Southwest Desert IPT. January.

Tetra Tech EM Inc. 2009. Proposed Plan for Former Naval Air Station Moffett Field, Site 25, Moffett Field, California. January.

U.S. Environmental Protection Agency (EPA). 2000 Fact Sheet #3 Final Remedy Selection for Results-based Corrective Action. EPA Office of Solid Waste. March 2000.

_______. 1997. The incidence and severity of sediment contamination in surface waters of the United States, Vol. 1. National sediment quality survey. United States Environmental Protection Agency. Office of Science and Technology. EPA 823-R-97-006. September.

Woodward Clyde Consultants. 1986. *PG&E/Shell Pond Study.* December.

Tables

ns (mg/kg)		Sediment Quality Benchmarks and Guidelines (mg/kg)															Project-specific Remedial Goals (mg/kg)													
			Long et al. (1995)[f]		Field et al. (2002)[g]		Buchman (2008)[h]					Canadian Environmental Quality Guidelines[i]		Barrick et al. (1988)[j,k]		RIVM (2001)[l]	Hunters Point Shipyard - Parcel F[m]		NWS Seal Beach Detachment Concord[n]								Former NAS Moffet Field[r]			
																	Surf Scoter		Low TRV-based PRGs[o]		High TRV-based PRGs[o]		Final Area-weighted Remedial Goals[p]				Final Remedial Goals		Black R	
co[c]	San Pablo Bay/ Carquinez Reference Sites[d]	SFB-RWQCB Wetland Surface Material[e]	ER-L	ER-M	T20	T50	TEL	PEL	AET	Dutch-Target	Dutch-Intervention	ISQG	PEL	AET-L	AET-H	SRCeco	RBV-Low	RBV--High	Site 32	Site33	Site 32	Site33	Site 32 Target	Site 33 Target	Site 32 Not to Exceed	Site 33 Not to Exceed	Target[s]	Not to Exceed[t]	RBV-Low	R
									18000																					
	13.4	15.3	8.2	70	7.4	20	7.24	41.6	35			7.2	41.6	57	700	5900			344	301	1379	1206	689	603	1380	1200				
							130.1		48							7200													131	
	0.25	0.33	1.2	9.6	0.38	1.4	0.68	4.21	3			0.7	4.2	5.1	9.6	820			6	5	1245	1089	12.2	10.7	124	120			0.596	
	217	112	81	370	49	141	52.3	160	62			52.3	160	260	270	43000														
									10							3200													2.28	
	65.8	68.1	34	270	32	94	18.7	108	390			18.7	108	390	1300	660	135	271	55	48	1373	1201	111	96.7	200	150			9.91	
	30.2	43.2	46.7	218	30	94	30.24	112	400			30.2	112	450	660	63000			1	1	553	484	95	95	553	484	33	93.8	0.205	
									260																					
	0.35		0.15	0.71	0.14	0.48	0.13	0.7	0.41					0.59	2.1	1500	0.94	1.87	1	1	7	6	2.98	2.62	6.89	6.03				
																23000														
	129	112	20.9	516	15	47	15.9	42.8	110							2600														
	0.22	0.64							1										9	8	37	33	12	16.1	24.18	28.3				
	0.304	0.58	1	3.7	0.23	1.1	0.73	1.77	3.1					6.1	6.1														71.8	
									57																					
	178	158	150	410	94	245	124	271	410					410	1600	6600			1208	1057	12082	10572	2420	2110	12100	10600	180	314		
									4.5																					
	0.0094	0.0121			0.021	0.094																								
	0.0173	0.0194	0.07	0.67	0.021	0.128						0.0202	0.201	0.67	1.9															
	0.0106	0.026	0.016	0.5	0.019	0.116	0.00671	0.0889	0.13			0.00671	0.0889	0.5	2														0.135	
	0.02	0.088	0.044	0.64	0.014	0.14	0.00587	0.128	0.071			0.00587	0.128	1.3	1.3														0.245	
	0.0127	0.0253	0.019	0.54	0.019	0.114	0.0212	0.144	0.12			0.0212	0.144	0.54	3.6															
	0.0356	0.0558	0.16	2.1	0.03	0.217	0.0346	0.391	0.23	0.12	17	0.0346	0.391	2.1	2.7	17														
	0.115	0.237	0.24	1.5	0.068	0.455	0.0867	0.544	0.66	3.3	31	0.0867	0.544	1.5	6.9	31													0.5	
	0.287	0.434	0.552	3.16			0.312	1.442	1.2	1	40			5.2	24															
	0.48	0.371	0.43	1.6	0.069	0.52	0.0888	0.763	1.1	0.052	7	0.0888	0.763	1.6	3.6	28													10.6	
	0.617	0.371			0.13	1.107			1.8					3.6	9.9														10.6	
	0.379	0.31			0.067	0.497			0.67					0.72	2.6	33													10.6	
	0.236	0.289	0.384	2.8	0.082	0.65	0.108	0.846	0.95	8.1	35	0.108	0.846	2.8	9.2	35													11.9	
	0.394	0.382			0.068	0.488			0.6					0.69	2.6	1.9													10.6	
	0.544	0.665	0.665	2.6	0.125	0.932	0.153	1.398	2.4			0.153	1.398	3.3	16														0.0265	
	3.995	3.06	1.7	9.6			0.655	6.676	7.9	1	40			17	69															
	4.28	3.39	4.022	44.792			1.684	16.77		1	40																			
									0.065					0.65	0.76															
							0.182	2.647	1.3	0.1	10			1.3	1.9															
									0.006	1	84			0.16	0.16	84														
									0.004	0.03	50			0.01	0.037	110														
									0.057	0.002	4			0.057	0.14	16														
									0.004	0.13	17			0.04	0.12	17														

of test organisms may encounter adverse effects
samples for amphipod survival
samples for amphipod survival

ues - those values based on effects concentrations representing no observed adverse effects or very low observed adverse effects.
lues - those values based on a lowest observed adverse effect, apparent effect threshold, or serious adverse effect.

001) and cited Entrix (2009b). Background for organics based on ambient sediment concentrations (>40% fines) defined in SFEI (2008) as cited in Entrix (2009b).
in Soil. General Chemical Corporation, Bay Pont Works Facility, Pittsburg, CA. May 15.

Tubbs Island (99.4% fines), and Island #1 (99% fines) in SFB-RWQCB (2000).
l materials: Sediment screening and testing guidelines. May.
. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environ. Manage.* 19: 81-97

ns (mg/kg)		Sediment Quality Benchmarks and Guidelines (mg/kg)															Project-specific Remedial Goals (mg/kg)														
			Long et al. (1995)[f]		Field et al. (2002)[g]		Buchman (2008)[h]					Canadian Environmental Quality Guidelines[i]		Barrick et al. (1988)[j,k]		RIVM (2001)[l]	Hunters Point Shipyard - Parcel F[m]		NWS Seal Beach Detachment Concord[n]								Former NAS Moffet Field[r]			
																	Surf Scoter		Low TRV-based PRGs[o]		High TRV-based PRGs[o]		Final Area-weighted Remedial Goals[p]				Final Remedial Goals		Black R	
co ...[c] ...[b]	San Pablo Bay/ Carquinez Reference Sites[d]	SFB-RWQCB Wetland Surface Material[e]	ER-L	ER-M	T20	T50	TEL	PEL	AET	Dutch-Target	Dutch-Intervention	ISQG	PEL	AET-L	AET-H	SRCeco	RBV-Low	RBV--High	Site 32	Site33	Site 32	Site33	Site 32 Target	Site 33 Target	Site 32 Not to Exceed	Site 33 Not to Exceed	Target[s]	Not to Exceed[t]	RBV-Low	R

3. Canadian Environmental Quality Guidelines, Summary Table: Summary of Existing Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment, Winnipeg. December.

38. Sediment quality values refinement: 1988 update and evaluation of Puget Sound AET. Vol. 1. Prepared for the Puget Sound Estuary Program, Office of Puget Sound. Values used as cited in USEPA 1997.

nation in surface waters of the United States, Vol. 1. National sediment quality survey. United States Environmental Protection Agency. Office of Science and Technology. EPA 823-R-97-006. September.

ional Institute of Public Health and the Environment). RIVM Report 7111701 023. Technical evaluation of the intervention values for soil/sediment and groundwater: Human and ecotoxicological risk assessment derivation of risk limits for soil, aquatic sediment, and groundwater. February.

Parcel F, Hunters Point Shipyard, San Francisco, California. BAI.5106.0004.0003. April.

Report for Litigation Area Site 32 (Unit 7 Mosquito Abatement Ditches) 33 (Units 10 and 11, Lost Slough), and 34 (Nichols Creek Erosional Areas). Naval Weapons Station Seal Beach, Detachment Concord, Concord, California. Prepared for Naval Facilities Engineering Command Southwest Desert IPT. January.

d High TRVs for California black rail, Virginia rail, Suisun song sparrow, mallard, great blue heron, and river otter. Values for the Virginia rail were the most conservative and were selected to use in deriving the Final Remedial Goals.

value was derived using the High TRV-based PRG and adjusted downward for each subarea until the area-weighted goals were equal to twice the Low TRV-based PRG or ambient concentrations (whichever was higher).

Station Moffett Field, Site 25, Moffett Field, California. January.

y Study, Human Health and Ecological Risk Assessment, Hamilton Army Airfield, North Antenna Field, California. April.

TABLE 2-2

Preliminary Remedial Goals for Sediment

PG&E Shell Pond - Ecological Preliminary Cleanup Goals

	Preliminary Remedial Goals for Sediment (mg/kg)							
Analyte	EcoPRG-Low	Receptor	Effect Level	Source	EcoPRG-High	Receptor	Effect Level	Source
Aluminum	29503		background	Entrix 2009b				
Arsenic	29		background	Entrix 2009b	41.6	macroinvertebrates	PEL	Buchman 2008
Barium	386		background	Entrix 2009b	459	salt marsh harvest mouse	RBV-High	CH2M HILL 2007
Beryllium	1		background	Entrix 2009b				
Cadmium	1.2	macroinvertebrates	ER-L	Long et al. 1995	9.6	macroinvertebrates	ER-M	Long et al. 1995
Chromium	217		background	SFB-RWQCB 2000	370	macroinvertebrates	ER-M	Long et al. 1995
Cobalt	30		background	Entrix 2009b	42.6	clapper rail	RBV-High	CH2M HILL 2007
Copper	68.1		surface material	SFB-RWQCB 2000	270	macroinvertebrates	ER-M	Long et al. 1995
Lead	43.2		surface material	SFB-RWQCB 2000	218	macroinvertebrates	ER-M	Long et al. 1995
Manganese	1171		background	Entrix 2009b				
Mercury	0.43		background	Entrix 2009b	0.71	macroinvertebrates	ER-M	Long et al. 1995
Methyl mercury								
Molybdenum	9.3		background	Entrix 2009b	23000	macroinvertebrates	SRCeco	RIVM 2001
Nickel	129		background	SFB-RWQCB 2000	516	macroinvertebrates	ER-M	Long et al. 1995
Selenium	3.5		background	Entrix 2009b	33	Virginia rail	HighPCG	Tetra Tech 2008
Silver	1	macroinvertebrates	ER-L	Long et al. 1995	3.7	macroinvertebrates	ER-M	Long et al. 1995
Thallium	2.5		background	Entrix 2009b				
Tungsten								
Vanadium	125		background	Entrix 2009b				
Zinc	178		background	SFB-RWQCB 2000	410	macroinvertebrates	ER-M	Long et al. 1995
Ammonia								
Cyanide (total)								
Sulfide (total)					4.5	macroinvertebrates	AET	Buchman 2008
1-Methylnaphthalene	0.021	macroinvertebrates	T20	Field et al. 2002	0.094	macroinvertebrates	T50	Field et al. 2002
2-Methylnaphthalene	0.07	macroinvertebrates	ER-L	Long et al. 1995	0.67	macroinvertebrates	ER-M	Long et al. 1995
Acenaphthene	0.016	macroinvertebrates	ER-L	Long et al. 1995	0.5	macroinvertebrates	ER-M	Long et al. 1995
Acenaphthylene	0.044	macroinvertebrates	ER-L	Long et al. 1995	0.64	macroinvertebrates	ER-M	Long et al. 1995
Fluorene	0.019	macroinvertebrates	ER-L	Long et al. 1995	0.54	macroinvertebrates	ER-M	Long et al. 1995
Naphthalene	0.16	macroinvertebrates	ER-L	Long et al. 1995	2.1	macroinvertebrates	ER-M	Long et al. 1995
Phenanthrene	0.24	macroinvertebrates	ER-L	Long et al. 1995	1.5	macroinvertebrates	ER-M	Long et al. 1995
LMW PAHs	0.552	macroinvertebrates	ER-L	Long et al. 1995	3.16	macroinvertebrates	ER-M	Long et al. 1995
Benzo(a)pyrene	0.43	macroinvertebrates	ER-L	Long et al. 1995	1.6	macroinvertebrates	ER-M	Long et al. 1995
Benzo(b)fluoranthene	0.13	macroinvertebrates	T20	Field et al. 2002	1.107	macroinvertebrates	T50	Field et al. 2002
Benzo(g,h,i)perylene	0.067	macroinvertebrates	T20	Field et al. 2002	0.497	macroinvertebrates	T50	Field et al. 2002
Chrysene	0.384	macroinvertebrates	ER-L	Long et al. 1995	2.8	macroinvertebrates	ER-M	Long et al. 1995
Indeno(1,2,3-cd)pyrene	0.068	macroinvertebrates	T20	Field et al. 2002	0.488	macroinvertebrates	T50	Field et al. 2002
Pyrene	0.665	macroinvertebrates	ER-L	Long et al. 1995	2.6	macroinvertebrates	ER-M	Long et al. 1995
HMW PAHs	1.7	macroinvertebrates	ER-L	Long et al. 1995	9.6	macroinvertebrates	ER-M	Long et al. 1995
Total PAHs	4.022	macroinvertebrates	ER-L	Long et al. 1995	44.792	macroinvertebrates	ER-M	Long et al. 1995
Mercaptans								

TABLE 2-2

Preliminary Remedial Goals for Sediment

PG&E Shell Pond - Ecological Preliminary Cleanup Goals

	Preliminary Remedial Goals for Sediment (mg/kg)							
Analyte	**EcoPRG-Low**	**Receptor**	**Effect Level**	**Source**	**EcoPRG-High**	**Receptor**	**Effect Level**	**Source**
Benzoic acid					0.065	macroinvertebrates	AET	Buchman 2008
Bis(2-ethylhexyl)phthalate	0.182	macroinvertebrates	TEL	Buchman 2008	2.647	macroinvertebrates	PEL	Buchman 2008
Dimethyl phthalate					0.006	macroinvertebrates	AET	Buchman 2008
1,2,3-Trimethylbenzene								
Ethylbenzene	0.03	macroinvertebrates	Dutch Target	Buchman 2008	0.037	macroinvertebrates	AET-H	Barrick et al. 1988
n-Butylbenzene								
p-Isopropyltoluene								
Tetrachloroethene	0.002	macroinvertebrates	Dutch Target	Buchman 2008	0.057	macroinvertebrates	AET	Buchman 2008
Xylene (total)	0.13	macroinvertebrates	Dutch Target	Buchman 2008	17	macroinvertebrates	Dutch Intervention	Buchman 2008

Notes:

EcoPRG-Low = Ecological preliminary clean-up goal based on background or low screening values (generally no observed effects concentrations).

EcoPRG-High = Ecological preliminary clean-up goal based on high toxicity reference values (lowest observed adverse effect concentrations).

ER-L = Effects range low

ER-M = Effects range median

TEL = Threshold Effects Level

PEL = Probable Effects Level

AET- Apparent Effects Threshold

T20 - concentration corresponding to the 20% proportion of toxic samples for amphipod survival

T50 - concentration corresponding to the 50% proportion of toxic samples for amphipod survival

RBV - risk based value

Selection of Ecological PCGs

Ecological PCGs were selected through source heirarchy. The 3 main categories of screening values (Ambient Values, Sediment Quality Benchmarks, and Project-specific Remedial Goals) were presented in order of highest to lowest priority (See Table 1). Sources within each category are also listed in hierarchical order from highest to lowest priority. Site-specific values were considered of equivalent confidence, with the exception of site-specific area-weighted values, which were not considered. The sources of values in the highest priority category (Ambient Values) were reviewed. If a value was not available in the highest priority source, then the next source is used. If no values were available in the higest priority category (i.e., Ambient Values), then the next category (Sediment Quality Benchmarks) was reviewed, followed by the last category (Project-specific Remedial Goals).

TABLE 2-3
Proposed Remediation Goals
Shell Pond Remedy Project
Bay Point, California

Analyte	**EcoPCG-Low** ***mg/kg***	**EcoPCG-High** ***mg/kg***
Chromium	217	370
Cobalt	30	42.6
Copper	68.1	270
Lead	43.2	218
Mercury	0.43	0.71
Molybdenum	9.3	23000
Nickel	129	516
Sulfide (total)		4.5
1-Methylnaphthalene	0.021	0.094
2-Methylnaphthalene	0.07	0.67
Acenaphthene	0.016	0.5
Acenaphthylene	0.044	0.64
Fluorene	0.019	0.54
Naphthalene	0.16	2.1
Phenanthrene	0.24	1.5
LMW PAHs	0.552	3.16
Benzo(a)pyrene	0.43	1.6
Benzo(b)fluoranthene	0.13	1.107
Benzo(g,h,i)perylene	0.067	0.497
Chrysene	0.384	2.8
Indeno(1,2,3-cd)pyrene	0.068	0.488
Pyrene	0.665	2.6
HMW PAHs	1.7	9.6
Total PAHs	4.022	44.792

Notes:
1. Metals included in the above list had one or more sample results above the LowEcoPRGs as contained in preliminary data Table A-2 included in Appendix A.
2. All polynuclear aromatic hydrocarbons are included although some analytes did not exceed LowEcoPRGs in any samples of non-native material. See Table A-1 in Appendix A.

atives Relative to Selection Criteria

uman d the nent	Attain Media Cleanup Goals/Standards	Control Sources of Releases	Comply with Standards for Management of Wastes	Long-term Effectiveness and Permanence	Reduction of TMV through Treatment	Short-term Effectiveness	Implementability
uman essment ted the not n health ssing	Would achieve protectiveness by eliminating exposure pathway rather than removing impacted material.	Releases regulated by NDPES discharge permit. Past monitoring indicates that some criteria (pH, dissolved oxygen and mercury) have exceeded limits and that treatment may be needed to maintain compliance with discharge requirements. Odors are controlled.	Approved under CA.	Effective as long as water cap in place, but does not remove or treat impacted material. Ongoing O&M required.	Would not treat impacted material	Could be constructed in one year with minimal traffic.	Easily Implemented
ld more trol n health mpared	Would achieve protectiveness by eliminating exposure pathway rather than removing impacted material.	Would eliminate odors and dust from pond. May not eliminate need for NPDES permit.	Soil cover would not meet prescriptive requirements of a Class 2 SWMU, but could be engineered to meet performance standards.	Effective as long as soil cap in place, but does not remove or treat impacted material. Ongoing O&M required	Would not treat impacted material	Could be implemented in 2 years but would generate truck traffic to bring in soil cover.	Special equipment will be need operate over very soft ground. A large quantity of import for fi will be required; fill materials sh erosion-resistant materials. Monitoring and periodic mainte required to prevent erosion of t overlying cover material.
ld more trol n health mpared nd on over gained ver naterial.	Would achieve cleanup goals/standards over entire 73 acres of pond.	Would eliminate odors and dust from pond.	Soil cover would not meet prescriptive requirements of a Class 2 SWMU, but could be engineered to meet performance standards.	Effective as long as soil cap in place, but does not remove or treat impacted material. Ongoing O&M required	Would not treat impacted material	Could be implemented in 2 years but would generate truck traffic to bring in soil cover.	Special equipment will be need operate over very soft ground a hydraulically remove the impac material. Monitoring and periodic mainte required to prevent erosion of t overlying cover material.
ld more trol n health mpared	Would achieve cleanup goals/standards over approximately 90% of pond area.	Would eliminate odors and dust from pond.	Soil cover would not meet prescriptive requirements of a Class 2 SWMU, but could be engineered to meet performance standards.	Effective as long as soil cap in place, but does not remove or treat impacted material. Ongoing O&M required	Would not treat impacted material	Could be implemented in 2 years but would generate truck traffic to bring in soil cover.	Special equipment will be need operate over very soft ground a hydraulically remove the impac material. Monitoring and periodic mainte required to prevent erosion of t overlying cover material.
om ial in the inated ted be offsite y.	Would achieve cleanup goals/standards over the entire pond area.	Permitted offsite facility may have more robust control systems.	Complete removal is accepted option for management of wastes and eliminates waste unit.	Would meet requirements for offsite disposal of material.	Would not treat impacted material	Could be implemented in 2 years but would generate considerable truck traffic for offsite material disposal.	Special equipment will be need operate over very soft ground a hydraulically remove the impac material.

Environmental Protection Measures	Comments
ic power instead of diesel motors or generators where feasible.	
dling time for all equipment and vehicles; ensure engines are properly maintained.	
e soil for cover of Carbon Black Area to reduce truck trips for material delivery.	
dfill as close to site as possible.	
onstruction activities in phases to reduce daily emissions.	
nd implement nitrogen oxide (NOx) Emission Reduction Plan to achieve project-wide fleet-average 20 percent NOx reduction.	
ruction equipment that is equipped with Best Available Control Technology (BACT) for NOx emissions reduction.	
ornia Air Resources Board most recent certification standard for off-road heavy-duty diesel engines.	
t all basic and enhanced control measures for fugitive dust identified by the Bay Area Air Quality Management District	These measures include: prevention of fugitive dust emis mixing areas, and/or watering unpaved roads, soil stockp soil or loose materials; limiting vehicle speeds on unpave tracking of soil onto public roadways and cleaning the ro
t that equipment used meets air emission and noise specifications.	
nd implement an odor control plan that includes use of odor-control and/or suppressant surfactant products during removal and handling of e material.	Products are aqueous-based surfactants and would be a dilution ratio determined by the bench and pilot testing st applied in a manner that minimizes dispersion to areas o
re-construction bird nesting surveys for work areas to be used during bird breeding season. Establish buffers around any actives nests as e and prepare an Avian Protection Plan for construction work prior to construction activities.	Surveys for California clapper rail are planned for early 2
nd implement a Biological Resource Protection Measures Plan.	Plan will include requirements for training of workers, dai ensure that no special status species are within work are special status species is observed in the work area.
workers to understand requirements for work adjacent to sensitive habitats and to recognize sensitive species.	
iological monitoring and oversight during construction activities as required by the permitting agencies. Biological monitor will have authority rk if there is potential to adversely affect a sensitive species.	
delineate areas including placement of exclusion fencing in consultation with California Department of Fish and Game (CDFG) to avoid ensitive habitat.	
onstruction activities outside of species windows (Delta smelt, California clapper rail and California black rail) where feasible and otherwise ruction areas to outside buffer zones for sensitive species during nesting or salmonid seasons.	A 500-foot buffer zone for potential clapper rail habitats e pilot testing.
limits of the work areas and staging area and the locations of access roads and ensure that they are properly marked before the on begins.	Hydraulic removal is planned to occur in 2011 following r
ehicle traffic to project roadways and reduce vehicle speeds to 10 mph on the levees and 15 mph on other project roads.	Breaching of the levee and any work outside of the levee Delta smelt work restriction window.
od management practices including: fencing to keep cattle from work area; remove and properly dispose of food-related trash; prohibit n project area except as authorized for security or law enforcement officials; prohibit pets in project area.	
rs, except for hydraulic removal, shall be limited to daytime only and will begin no sooner than one-half hour after sunrise and end at least our before sunset.	
workers to recognize potential buried artifacts or human remains.	No cultural resources were identified within the project a
and consult with a qualified archaeologist who will determine next steps and appropriate treatment measures.	
ative fuel construction vehicles and equipment for at least 15 percent of the fleet.	Greenhouse gas emissions will temporarily increase due However, restoration of the pond area to tidal marsh will and reduce green house gases in the project area.
al building materials for at least 10 percent of all building materials.	
for Carbon Black Area will be local source.	
and develop NOx Emission Control Plan as part of measures for Air Emissions.	

Environmental Protection Measures	Comments
t project-specific Health and Safety Plan. onstruction activities in accordance with California Occupation Safety and Health Administration (Cal-OSHA) standards contain in Title 8 of nd implement Transportation Management Plan and Emergency Response Plan. nd implement a Hazardous Materials Control Plan for all hazardous materials that may be brought to the site or generated at the site.	
t noise avoidance and minimization measures to avoid adverse affects to wildlife. valuation or monitoring to ensure that noise levels at nearest residence comply with Contra Costa General Plan 2005-2020 Noise Element. ging areas, material handling areas and construction equipment away from sensitive species/habitats and residential receptors as practical. er noise equipment (e.g. electric), add mufflers or sound barriers around stationary equipment where feasible. ork during daytime hours with the exception of dredging activities.	
implement a transportation management plan that includes measures such as: g impacts of hauling during peak traffic hours by adjusting routes and haul times ting paved, local road conditions before and after construction activities and restoring pavement damaged by heavy construction vehicles e project	
ate that water from dewatering of hydraulically removed sediment, stormwater that may accumulate in the material handling area, and sh-down water can be circulated back to the pond. ate that water resulting from removal activities meets requirements for discharge prior to breaching of the pond. ate that remaining material (sediment) in the pond meets project cleanup goals. breaching of the pond to minimize turbidity. nd implement a stormwater pollution prevention plan as required for construction projects. or refueling will be allowed onsite except where it is impractical to send vehicles and equipment offsite for fueling.	Recirculation of water generated from dewatering will mi (from the slough or other sources such as Contra Costa impacted-non-native material.

TABLE 5-1
Summary of Regulations Relevant to the Shell Pond Remediation Project
PG&E, Bay Point, California

Permit/ Approval	Permitting Agency	Comments
Section 404 Permit	U.S. Army Corps of Engineers (USACE)	Required for fill/dredge within Waters of the U.S. or impacts to wetlands.
Section 7 Consultation	U.S. Fish & Wildlife Service (USFWS)	Section 7 consultation of the federal Endangered Species Act (ESA) will likely focus on potential impacts to federal listed species and their critical habitat (California clapper rail, salt marsh harvest mouse, soft bird's beak).
Section 7 Consultation (anadromous fish)	National Marine Fisheries Service (NMFS)	Section 7 consultation will likely focus on potential impacts to federal listed anadromous fish (steelhead, Chinook salmon, green sturgeon).
401 Water Quality Certification/ Porter Cologne Act Review	California Regional Water Quality Control Board (CRWQCB)	Section 401 certification is required for Section 404 authorization. Section 401 certification will include turbidity control limits and reporting criteria.
Lake or Streambed Alteration Agreement (LSAA or 1602)	California Department of Fish and Game (CDFG)	Required for in-river and bank work. CDFG has not determined if this permit will be required for Shell Pond.
Sections 2080.1 and 2081 of the California Fish and Game Code	CDFG	CDFG will determine under Section 2080.1 that the federal incidental take authorization obtained through Section 7 of the federal ESA is consistent with California ESA. For species that are only state listed, the project would require a take permit under Section 2081(b).
California Fully Protected Species	CDFG	California Fully Protected Species are species that may not be taken or possessed at any time, and no licenses or permits may be issued for their take (California clapper rail, California black rail, white-tailed kite, and salt marsh harvest mouse).
Migratory Bird Treaty Act (MBTA)	USFWS	Under the MBTA, taking, killing, or possessing migratory birds is unlawful, as is taking of any parts, nests, or eggs of such birds.
Notice of Intent (NOI) and compliance with construction General Permit (CGP)	San Francisco Bay Regional Water Quality Control Board (RWQCB)	Commonly referred to as SWPPP process. The CGP was revised significantly in 2009-10 and compliance will be electronic after July 1, 2010. PG&E will be the legally responsible agency and held accountable for contractor discharge of sediment.
San Francisco Bay Conservation and Development Commission (BCDC) Permit	San Francisco BCDC	BCDC regulates changes to any water, land, or structure in San Francisco Bay pursuant to the McAteer-Petris Act.

TABLE 6-1
Shell Pond Restoration Schedule
PG&E, Bay Point, California

Task	Date
Draft CA Proposed Modification Report (Corrective Measures Study)	February 2010
Additional Pond Studies	February – March 2010
Bench Scale Testing	March – May 2010
Draft Final CA Modification Report (Corrective Measures Study)	May 2010
Revised Draft Final CA Modification Report (Corrective Measures Study)	November 2010
Permit Coordination	April 2010 – June 2011
Pilot Scale Testing	August 2010
Pilot and Bench Scale Report	November 2010
Design and Implementation plan	January 2010
CEQA/Public Comment	February - March 2011
Phase 1 Construction Activities (Access Road, Staging Areas)	April-May 2011
Resource Agency Permits	May-June 2011
Phase 2 Construction Activities (Non-native material removal) dewatering, and transportation and disposal [T&D])	June- December 2011 December 2011 – June 2012 (T&D)
Corrective Measures Report and Preliminary Construction Completion Report	March 2012
Phase 3 Construction Activities (levee breaching and natural tidal restoration)	August-September 2012
Final Construction Completion Report	December 2012

Figures


West Channel
East Channel
WEST PARCEL
APN: 098-250-013
SHELL POND PARCEL
APN: 098-260-001
Shell Pond
Carbon Black Area
SHELL POND PARCEL (SOUTH)
APN: 098-260-001
Wastewater Ditch
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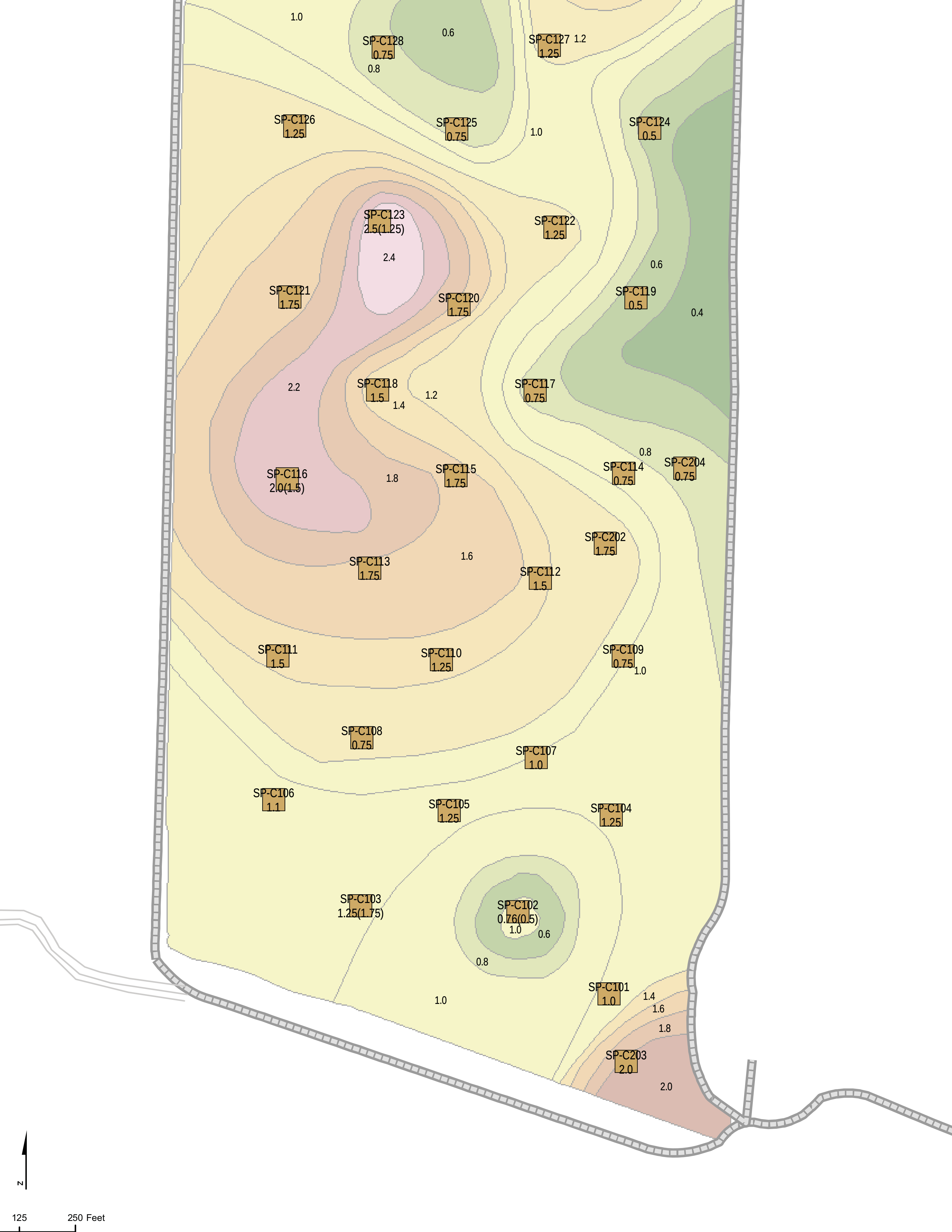
Gregory Dr
Suisun Ave
Briones Regional Park
780
24
LEGEND
0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2.4
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SP-C114
0.75
SP-C116
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1.8
SP-C115
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0.8
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1.0
1.4
1.6
1.8
1.0
SP-C203
2.0
2.0
N
125
250 Feet

LEGEND

Water cover over impacted non-native material

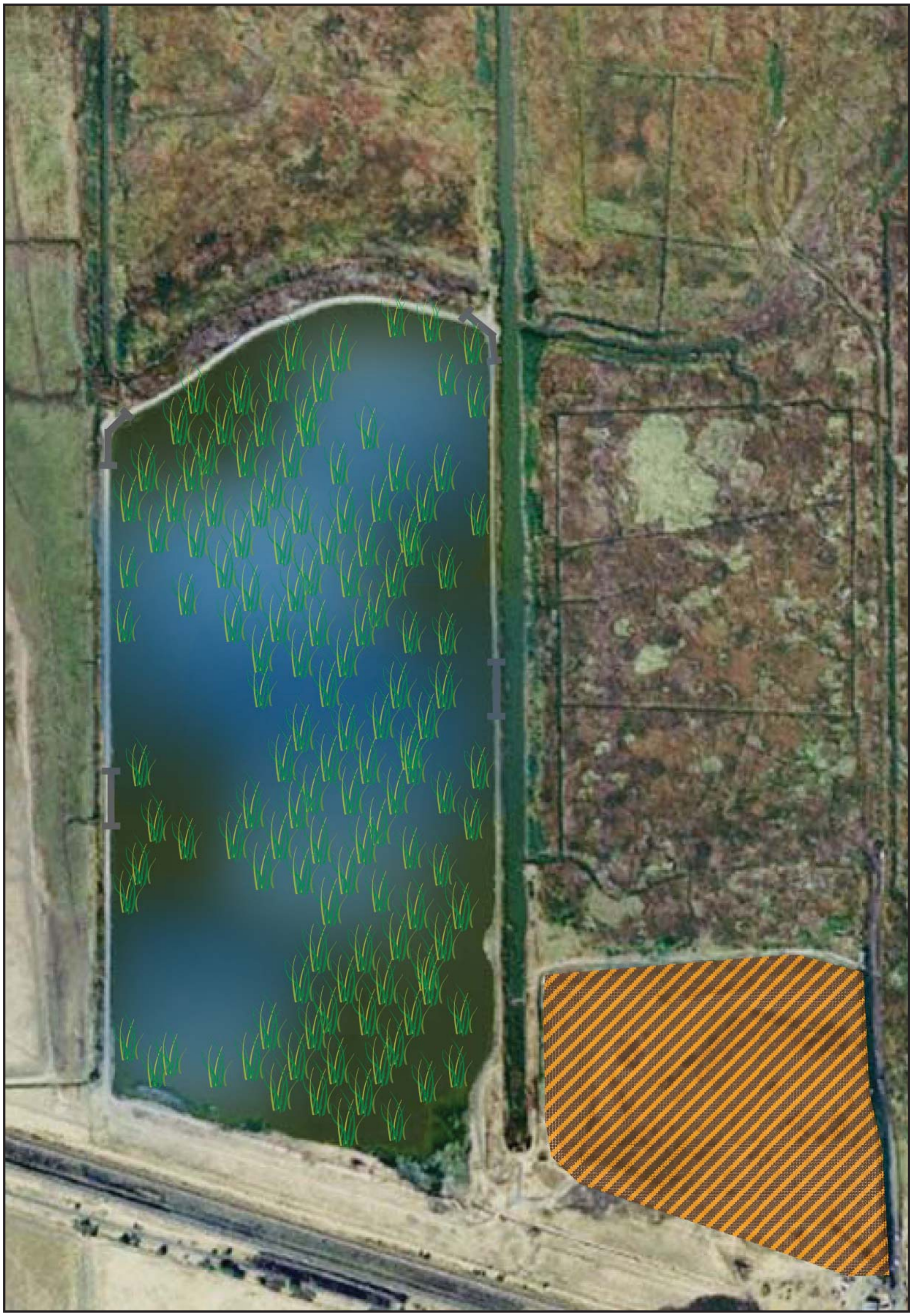
FIGURE 3-1
Alternative 1 – Water Cap Schematic
PG&E Shell Pond Project
Bay Point, California

LEGEND

Levee breach

Impacted non-native material cover/upland or marginal habitat

FIGURE 3-2
Alternative 2 – Cover Over Shell Pond
PG&E Shell Pond Project
Bay Point, California



LEGEND

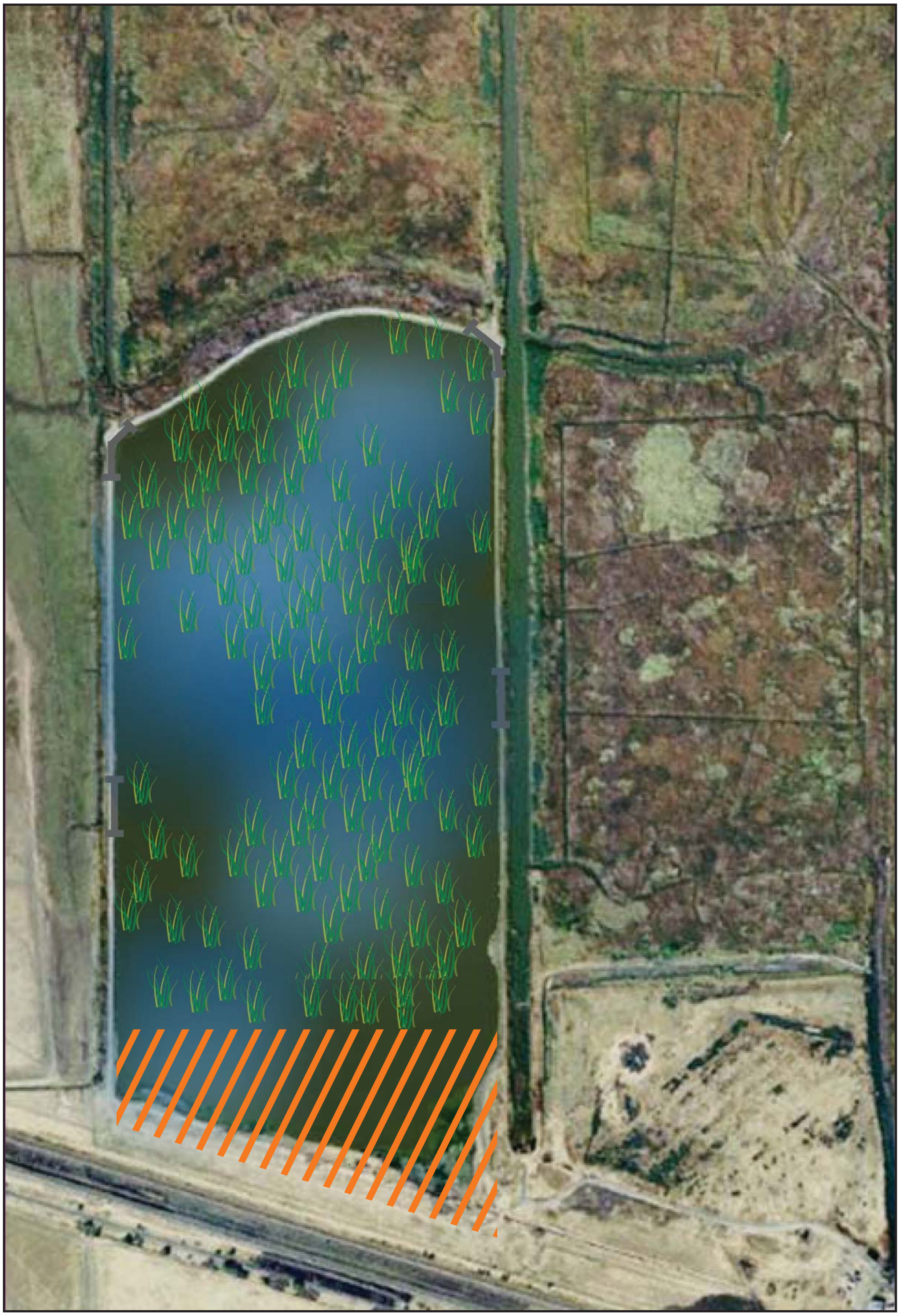
Levee breach

Excavate & restore as tidal wetland

Removed material f ll area; cover and vegetate

FIGURE 3-3
Alternative 3 – Consolidate Removed Material at Carbon Black Area
PG&E Shell Pond Project
Bay Point, California

CH2MHILL



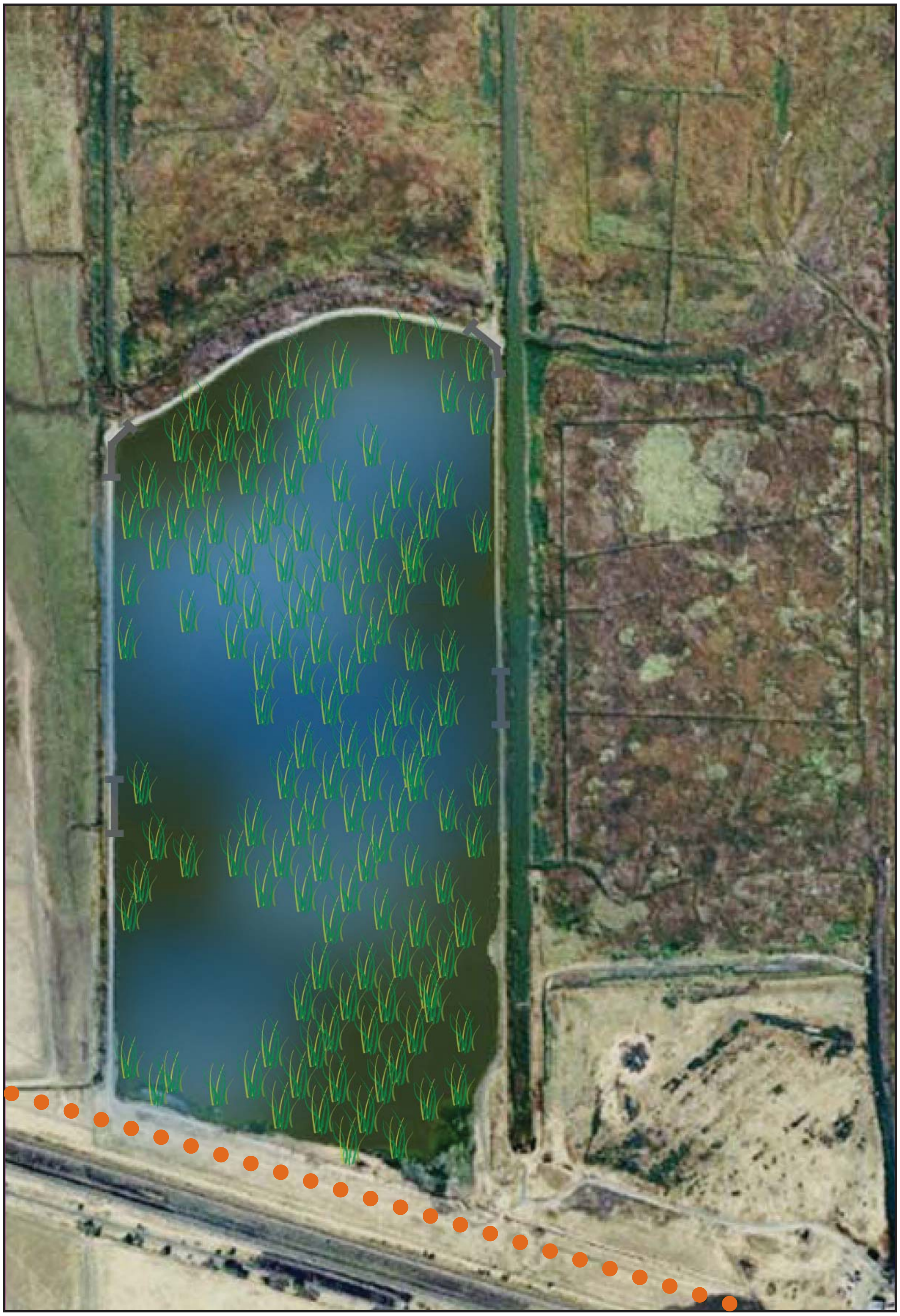
LEGEND

Levee breach

Graded habitat restoration

Consolidation of removed material
cover and vegetate

FIGURE 3-4
Alternative 4 – Consolidate Removed Material in Southern Shell Pond Area
PG&E Shell Pond Project
Bay Point, California



LEGEND

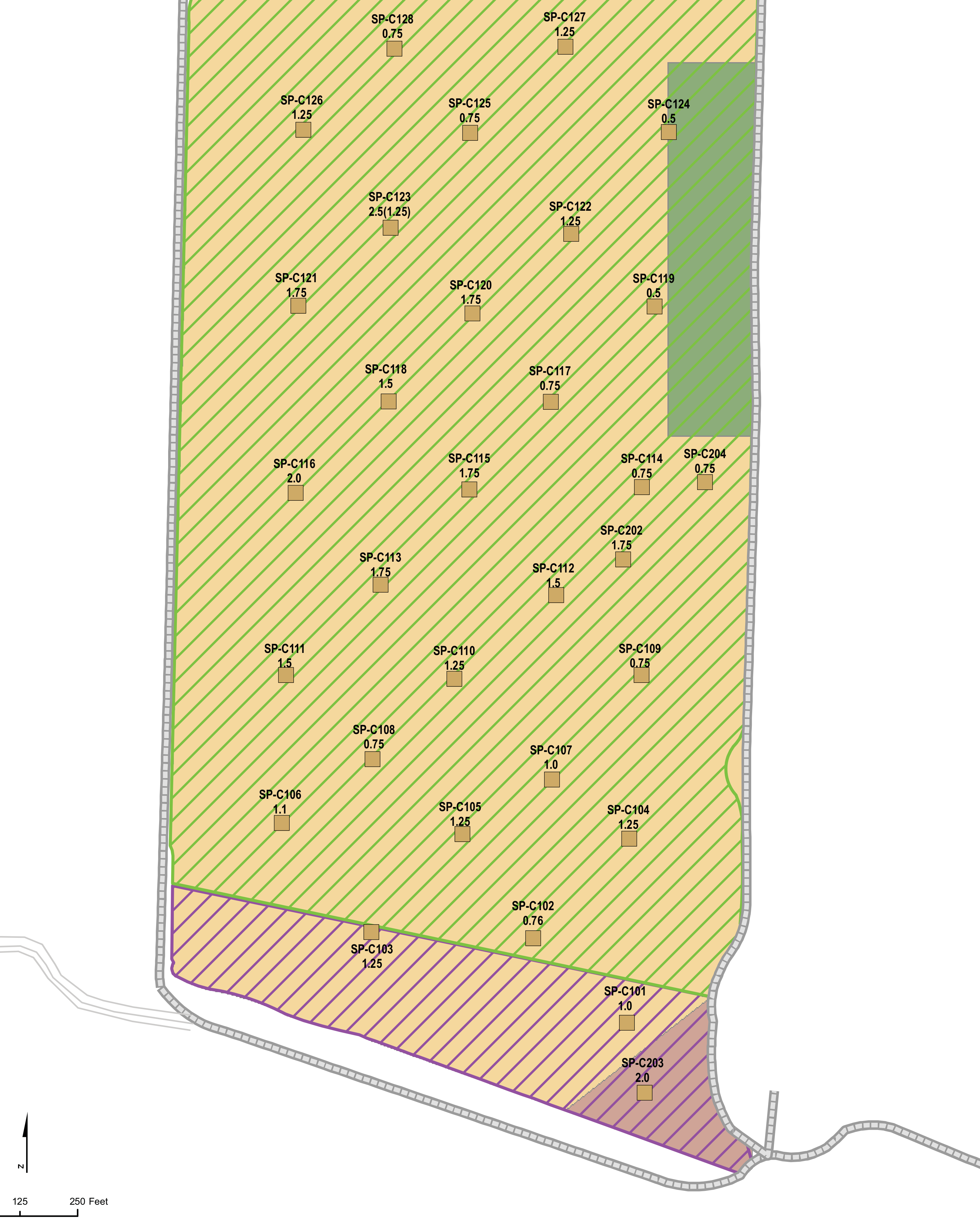
Levee breach

Remove impacted non-native material, restore as tidal wetland

Potential Great California Delta Trail

FIGURE 3-5
Alternative 5 – Remove Impacted Non-Native Material and Dispose Offsite
PG&E Shell Pond Project
Bay Point, California

CH2MHILL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1.75
SP-C120
1.75
SP-C119
0.5
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SP-C117
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SP-C116
2.0
SP-C115
1.75
SP-C114
0.75
SP-C204
0.75
SP-C202
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0.75
SP-C107
1.0
SP-C106
1.1
SP-C105
1.25
SP-C104
1.25
SP-C102
0.76
SP-C103
1.25
SP-C101
1.0
SP-C203
2.0
N
125
250 Feet

West Channel
East Channel
WEST PARCEL
APN: 098-250-013
SHELL POND PARCEL
APN: 098-260-001
Shell Pond
Carbon Black Area
Material Handling Area
ing and Material
andling Area
rary Gravel Access Road
Temporary Access Bridge
Power Hook-up
Material Handling Area
SHELL POND PARCEL (SOUTH)
APN: 098-260-001
Sanitary Sewer Hook-up
Wastewater Ditch
Sharon Dr
Gregory Dr
Suisun Ave
Briones Regional Park
LEGEND

Appendix A
Preliminary Analytical Results – April 2010 Shell Pond Investigation

Polycyclic Aromatic Hydrocarbons (mg/kg)

Low Molecular Weight							High Molecular Weight									
NE	NE	0.43	0.13	0.384	NE	0.068	0.016	0.044	NE	0.067	NE	0.019	0.021	0.07	0.16	0.24
NE	NE	1.6	1.107	2.8	NE	0.488	0.5	0.64	NE	0.497	NE	0.54	0.094	0.67	2.1	1.5
nzo (a) hracene	Benzo (k) fluor anthene	Benzo (a) pyrene	Benzo (b) fluor anthene	Chrysene	Dibenzo (a,h) anthracene	Indeno (1,2,3-cd) pyrene	Acena phthene	Acena phthylene	Anthracene	Benzo (ghi) perylene	Fluor anthene	Fluorene	1-Methyl naphthalene	2-Methyl naphthalene	Naphthalene	Phen anthre
.78 U	2.9 J	56 J	18 J	0.78 U	0.78 U	37 J	48 J	31 J	6.5 J	300 J	89 J	4.2 J	1.9 J	1.4 J	0.78 U	53 J
.86 U	2.6 J	43 J	15 J	0.86 U	0.86 U	30 J	2.9 J	25 J	1.7 J	260 J	42 J	0.86 UJ	1.8 J	1.4 J	0.86 U	14 J
0063 U	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.024	0.0063 U	0.0063 U	0.0063 U	0.0063 U	0.01	0.0063
0063 U	0.0063 U	0.045	0.016	0.0063 U	0.0063 U	0.037	0.0063	0.029	0.0063 U	**0.24**	0.08	0.0063 U	0.0063 U	0.0063 U	0.015	0.05
0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0058 U	0.0093	0.0058
.87 U	0.87 U	6.1 J	2.3 J	0.87 U	0.87 U	5.3 J	0.87 U	2.8 J	0.87 U	41 J	12 J	0.87 U	0.87 U	0.87 U	0.87 U	**1.2**
0.67 0.	13 U	**0.5**	0.13 U	**1.2**	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	**0.16**	0.3	0.13 U	0.13 U	0.13 U	0.13 U	0.13
.93 U	0.93 U	4.8 J	1.4 J	0.93 U	0.93 U	3.3 J	0.93 U	0.93 U	0.93 U	32 J	20 J	0.93 U	0.93 U	0.93 U	0.93 U	3.2
0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.0066 U	0.019	0.0066
095 U	0.095 U	**1**	**0.27**	0.095 U	0.095 U	1.2	0.095 U	**0.4**	0.095 U	9	1.3	0.095 U	0.095 U	0.095 U	0.095 U	**0.52**
0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0065 U	0.0078	0.0065
074 U	0.084	**0.87**	**0.29**	0.074 U	0.074 U	1.4	0.074 U	0.074 U	0.074 U	12	0.4	0.074 U	0.074 U	0.074 U	0.074 U	0.074
0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.046	0.0075	0.0075 U	0.0075 U	0.0075 U	0.0075	0.0075
11 UJ	0.11 UJ	**1.5 J**	**0.46 J**	0.11 UJ	0.11 UJ	1.4 J	0.11 UJ	0.11 UJ	0.11 UJ	15 J	3.7 J	0.11 UJ	0.11 UJ	0.11 UJ	0.11 UJ	0.11
012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.013	0.012 U	0.012 U	0.012	0.012 U	0.021	0.012
0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064 U	0.0064
0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075 U	0.0075	0.0075
097 U	0.21	2.8	**0.84**	0.097 U	0.097 U	2.9	0.097 U	0.097 U	0.097 U	25	3.8	0.097 U	0.097 U	0.097 U	0.097 U	0.097
019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019	0.019 U	0.12	0.019
1.1 U	1.1 U	9.2	2.5	1.1 U	1.1 U	8.9	1.1 U	1.1 U	1.1 U	92	20	1.1 U	1.1 U	1.1 U	1.1 U	1.1
032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032
.11 U	0.21	4.6	1.5	0.11 U	0.13	3.9	0.11 U	0.11 U	0.11 U	35	20	0.11 U	0.11 U	0.11 U	0.11 U	0.11
025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025
1 U	1 U	2.9 J	1 U	1 U	1 U	2.4 J	1 U	1 U	1 U	22 J	16 J	1 U	1 U	1 U	1 U	1 U
013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.017	0.013
014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.015	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014
1.2 U	1.2 U	6.2 J	1.6 J	1.2 U	1.2 U	5.3 J	1.2 U	1.2 U	1.2 U	53 J	26 J	1.2 U	1.2 U	1.2 U	1.2 U	1.2
0087 U	0.0087 U	0.014	0.0087 U	0.0087 U	0.0087 U	0.012	0.0087 U	0.0087 U	0.0087 U	**0.12**	0.059 0	.0087 U	**0.04**	0.0087 U	0.0087 U	0.02
014 U	0.014 U	0.033	0.014 U	0.014 U	0.014 U	0.031	0.014 U	0.014 U	0.014 U	**0.27**	0.085 0.014	U	**0.039**	0.014 U	0.043	0.03
1.1 U	1.5 J	5.1 J	1.1 U	1.1 U	1.1 U	3.6 J	1.1 U	1.1 U	1.1 U	35 J	22 J	1.1 U	1.1 U	1.1 U	1.1 U	1.1
0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.023	0.019	0.0096 U	0.018	0.0096 U	0.014	0.01
011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011
014 U	0.19	3.6	**0.89**	0.014 U	0.099	2.7	0.014 U	0.014 U	0.014 U	32	4.5	0.014 U	0.014 U	0.067	0.014 U	0.014
.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.045	0.03
035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.11	0.035
028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.058	0.02
1.2 U	1.2 U	4 J	1.2 U	1.2 U	1.2 U	3.3 J	1.2 U	1.2 U	1.2 U	30 J	18 J	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U

Polycyclic Aromatic Hydrocarbons (mg/kg)

Low Molecular Weight							High Molecular Weight									
NE	**NE**	**0.43**	**0.13**	**0.384**	**NE**	**0.068**	**0.016**	**0.044**	**NE**	**0.067**	**NE**	**0.019**	**0.021**	**0.07**	**0.16**	**0.2**
NE	**NE**	**1.6**	**1.107**	**2.8**	**NE**	**0.488**	**0.5**	**0.64**	**NE**	**0.497**	**NE**	**0.54**	**0.094**	**0.67**	**2.1**	**1.5**
nzo (a) hracene	**Benzo (k) fluor anthene**	**Benzo (a) pyrene**	**Benzo (b) fluor anthene**	**Chrysene**	**Dibenzo (a,h) anthracene**	**Indeno (1,2,3-cd) pyrene**	**Acena phthene**	**Acena phthylene**	**Anthracene**	**Benzo (ghi) perylene**	**Fluor anthene**	**Fluorene**	**1-Methyl naphthalene**	**2-Methyl naphthalene**	**Naphthalene**	**Phe anthre**
099 U	0.15 J	2.3	**0.7**	0.099 UJ	0.099 UJ	3.1	0.099 UJ	0.099 U	0.099 U	30	8 J	0.099 U	0.099 U	0.099 U	0.099 U	0.099
019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019	0.019
026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026
.1 UJ	0.17 J	2.2 J	**0.59 J**	0.1 UJ	0.1 UJ	1.6 J	0.1 UJ	0.1 UJ	0.1 UJ	18 J	11 J	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 U
025 U	0.025 U	0.032	0.025 U	0.025 U	0.025 U	0.025	0.025 U	0.025 U	0.025 U	**0.24**	0.12	0.025 U	0.29	0.025 U	0.025 U	0.03
034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.14	0.03
.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.059	0.04
.11 U	0.11 U	**1.3**	**0.38**	0.11 U	0.11 UJ	1.6 J	0.11 UJ	0.11 U	0.11 U	15 J	3.2 J	0.11 U	0.11 U	0.11 UJ	0.11 UJ	0.11
032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032
2 U	2 U	13 J	3.5 J	2 U	2 U	12 J	2 U	2 U	2 U	120 J	26 J	2 U	2 U	2 U	2 U	2 U
.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03
.14 U	0.19	1.9	**0.57**	0.14 U	0.14 U	2.6	0.14 U	0.14 U	0.14 U	21	1.9	0.14 U	0.14 U	0.14 U	0.14 U	0.14
.11 U	0.13	**1.3 J**	**0.48**	0.11 U	0.11 U	1.6 J	0.11 U	0.11 U	0.11 U	14 J	5 J	0.11 U	0.11 U	0.11 U	0.11 U	0.11
033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033
.11 U	0.23	2.5 J	**0.88**	0.11 U	0.11 U	3 J	0.11 U	0.11 U	0.11 U	26 J	11 J	0.11 U	0.11 U	0.11 U	0.11 U	0.11
034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034
017 U	0.052	**0.83**	**0.31**	0.017 U	0.042	0.9	0.017 U	0.017 U	0.017 U	12	0.81	0.017 U	0.017 U	0.017 U	0.034	0.017
035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.044	0.035
032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032
12 UJ	0.15	2	**0.59**	0.12 U	0.12 U	2.2	0.12 U	0.12 U	0.12 U	19 J	4.6	0.12 U	0.12 U	0.12 U	0.12 U	0.12
036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036
028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028
1.3 U	1.3 UJ	4.9	2 J	1.3 U	1.3 UJ	4.7 J	1.3 U	4.4 J	1.3 U	38 J	5.2 J	1.3 UJ	1.3 U	1.3 U	**1.8**	1.9
061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061
032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032
.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.087	0.03
19 UJ	0.32 J	3.7 J	1.6 J	0.19 UJ	0.19 J	4.4 J	0.19 UJ	0.19 UJ	0.19 UJ	61 J	14 J	0.19 UJ	0.19 UJ	0.19 UJ	0.19 UJ	0.19 U
034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034
.11 U	0.11 U	**0.7**	**0.24**	0.11 U	0.11 U	0.76	0.11 U	0.11 U	0.11 U	10	0.59	0.11 U	0.11 U	0.11 U	0.11 U	0.11
034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.043	0.034
026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.041	0.02
.2 U	1.2 U	4.2	1.9	1.2 U	1.2 U	3.5	1.2 U	1.2 U	1.2 U	28	12	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.064	0.035
.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.11	0.03
13 UJ	0.67 J	**1.6 J**	**0.72 J**	0.13 UJ	0.13 UJ	1.9 J	0.13 UJ	0.13 UJ	0.13 UJ	21 J	4.4 J	0.13 UJ	0.13 UJ	0.13 UJ	0.13 UJ	0.13 U
.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.044	0.03
.23 U	0.27	5	1.3	0.23 U	0.23 U	5.2	0.23 U	0.23 U	0.23 U	48	16	0.23 U	0.23 U	0.23 U	0.23 U	0.23

Polycyclic Aromatic Hydrocarbons (mg/kg)

Low Molecular Weight										High Molecular Weight						
NE	**NE**	**0.43**	**0.13**	**0.384**	**NE**	**0.068**	**0.016**	**0.044**	**NE**	**0.067**	**NE**	**0.019**	**0.021**	**0.07**	**0.16**	**0.24**
NE	**NE**	**1.6**	**1.107**	**2.8**	**NE**	**0.488**	**0.5**	**0.64**	**NE**	**0.497**	**NE**	**0.54**	**0.094**	**0.67**	**2.1**	**1.5**
nzo (a) hracene	**Benzo (k) fluor anthene**	**Benzo (a) pyrene**	**Benzo (b) fluor anthene**	**Chrysene**	**Dibenzo (a,h) anthracene**	**Indeno (1,2,3-cd) pyrene**	**Acena phthene**	**Acena phthylene**	**Anthracene**	**Benzo (ghi) perylene**	**Fluor anthene**	**Fluorene**	**1-Methyl naphthalene**	**2-Methyl naphthalene**	**Naphthalene**	**Phen anthre**
.2 UJ	0.2 UJ	**1 J**	**0.32 J**	0.2 UJ	0.2 UJ	1.3 J	**0.22 J**	**0.39 J**	0.2 UJ	13 J	1.8 J	0.2 UJ	1.2 J	0.2 UJ	**0.7 J**	**0.77**
.23 J	0.22 UJ	**1.5 J**	**0.53 J**	0.22 UJ	0.22 UJ	2 J	**0.35 J**	**0.54 J**	0.22 UJ	21 J	3.1 J	**0.29 J**	2 J	**0.34 J**	**1 J**	**1.3**
027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.044	0.032	0.027 U	**0.043**	0.027 U	0.11	0.03
031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.035	0.031
.21 U	0.31	4.6	1.4	0.21 U	0.21 U	5.2	0.21 U	0.21 U	0.21 U	46	13	0.21 U	0.21 U	0.21 U	0.21 U	0.21
027 U	0.027 U	0.047	0.027 U	0.027 U	0.027 U	0.036	0.027 U	0.027 U	0.027 U	**0.35**	0.15	0.027 U	0.027 U	0.027 U	0.027 U	0.04
015 U	0.015 U	0.026	0.015 U	0.015 U	0.015 U	0.025	0.015 U	0.015 U	0.015 U	**0.17**	0.088	0.015 U	0.015 U	0.015 U	0.046	0.02
015 U	0.015 U	0.015	0.015 U	0.015 U	0.015 U	0.015 U	**0.026**	0.015 U	0.015 U	0.025	0.031	0.015 U	0.015 U	0.015 U	0.023	0.015
0099 U	0.0099 U	0.024	0.0099 U	0.0099 U	0.0099 U	0.02	0.0099 U	0.0099 U	0.0099 U	**0.14**	0.052	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.02
034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	**0.058**	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034
037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037
032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032
017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	**0.08**	0.049	0.017 U	0.017 U	0.017 U	0.057	0.03
039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.12	0.03
.02 U	0.02 U	0.08	0.02 U	0.02 U	0.02 U	**0.088**	0.02 U	0.02 U	0.053	0.63	0.14	0.02 U	0.02 U	0.02 U	0.076	0.05
014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.014
011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.012	0.011
035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.062	0.035
035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.068	0.035
038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.04	0.038 U	0.038 U	0.038 U	0.05	0.038
036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.05	0.03
045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.051	0.045
039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039
037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037
042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042
045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.04
045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045	0.045
014 U	0.014 U	0.019	0.022	0.021	0.014 U	0.014	0.014 U	0.014 U	0.014 U	0.04	0.034	0.014 U	0.014 U	0.014 U	0.014 U	0.01
035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035
.14 U	0.34	6.9	1.7	0.14 U	0.15	4.5	0.14 U	0.14 U	0.14 U	49	33	0.14 U	0.14 U	0.14 U	0.14 U	0.14
023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	**0.076**	0.063 0.023	U	0.2	0.053	**0.49**	0.04
.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.051	0.042	0.02 U	**0.028**	0.024 0.02	U	0.02
.1 U	0.61	15	3.9	0.1 U	0.37	10	0.1 U	0.1 U	0.1 U	97	65	0.1 U	23	0.1 U	0.1 U	21
017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.031	0.022	0.017 U	0.017 U	0.017 U	0.017 U	0.01
018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.022	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U	0.051	0.01
.11 U	0.62	15	3.1	0.11 U	0.37	11	110	0.11 U	0.11 U	110	39	21	47	0.11 U	0.11 U	86
.11 U	0.51	11	2.6	0.11 U	0.28	9	0.11 U	0.11 U	0.11 U	78	23	0.11 U	0.11 U	0.11 U	0.11 U	0.11

Polycyclic Aromatic Hydrocarbons (mg/kg)

Low Molecular Weight										High Molecular Weight						
NE	**NE**	**0.43**	**0.13**	**0.384**	**NE**	**0.068**	**0.016**	**0.044**	**NE**	**0.067**	**NE**	**0.019**	**0.021**	**0.07**	**0.16**	**0.2**
NE	**NE**	**1.6**	**1.107**	**2.8**	**NE**	**0.488**	**0.5**	**0.64**	**NE**	**0.497**	**NE**	**0.54**	**0.094**	**0.67**	**2.1**	**1.5**
nzo (a) hracene	**Benzo (k) fluor anthene**	**Benzo (a) pyrene**	**Benzo (b) fluor anthene**	**Chrysene**	**Dibenzo (a,h) anthracene**	**Indeno (1,2,3-cd) pyrene**	**Acena phthene**	**Acena phthylene**	**Anthracene**	**Benzo (ghi) perylene**	**Fluor anthene**	**Fluorene**	**1-Methyl naphthalene**	**2-Methyl naphthalene**	**Naphthalene**	**Phen anthre**
.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	---	0.79 U	0.79 U	0.79
2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	*5.5*	2.9 U	2.9 U	---	2.9 U	2.9 U	2.9
3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	*22*	6.7	3.3 U	0.1 U	3.3 U	3.3 U	3.3
3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	*4*	3.3 U	3.3 U	---	3.3 U	3.3 U	3.3
2 U	2 U	*5.5*	*2.1*	2 U	2 U	*6.5*	2 U	2 U	2 U	*44 J*	28	2 U	1.2 U	2 U	2 U	*2.4*
4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	*36*	18	4.4 U	---	4.4 U	4.4 U	4.4
2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	*19 J*	6.4 J	2.1 U	0.13 UJ	2.1 U	0.13 UJ	2.1
3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	*18*	5.8	3.8 U	---	3.8 U	3.8 U	3.8
1.4 U	1.4 U	*7.9 J*	1.4 U	1.4 U	1.4 U	*5.2 J*	*5.4 J*	*7.9 J*	1.4 U	*37 J*	2.5	1.4 U	0.82 U	1.4 U	1.4 U	*7.3*

oals (Eco PCG) Low and High are Eco PCGs using Source Hierarchy. The main categories (Background Values, Sediment
eloped for the site were listed in order of highest to lowest priority. Sources within each category were also listed in hierarchical
ever, area-weighted values are not considered. If a value is not available in the highest priority source, then the next source is

logical Preliminary Cleanup Goals (Eco PCG) Low are bolded, detected results greater than the Eco PCG High are circled

boratory or data validation

Metals (mg/kg)

y:[1]	NE	29	386	1	1.2	217	30	68.1	43.2	0.43	9.3	129	3.5	1	2.5	125
n:	**NE**	**41.6**	**459**	**NE**	**9.6**	**370**	**42.6**	**270**	**218**	**0.71**	**23,000**	**516**	**33**	**3.7**	**NE**	**NE**
ple pe	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium
I	3.1 U	1.9	18 J	1.6 U	1.6 U	20 J	5.7 J	19 J	17 J	0.41 J	**44 J**	18 J	1.6 U	1.6 U	3.1 U	7.9 J
D	3.4 U	3.8	34 J	1.7 U	1.7 U	39 J	24 J	53 J	30 J	1.1 J	**69 J**	59 J	1.7 U	1.7 U	3.4 U	20 J
I	2.5 U	2.3	110	1.3 U	1.3 U	25	9.6	12	5.1	0.12 U	1.3 U	25	1.3 U	1.3 U	2.5 U	46
I	2.5 U	1.3 U	100	1.3 U	1.3 U	18	6.7	15	5.7	0.12 U	1.3 U	14	1.3 U	1.3 U	2.5 U	35
I	2.1 U	1.4	55	1.1 U	1.1 U	15	7.2	9.6	4.1	0.12 U	1.1 U	11	1.1 U	1.1 U	2.1 U	37
I	3.5 U	6.4	82	1.7 U	1.7 U	120	11	**77**	32	0.85	**130**	55	1.7 U	1.7 U	3.5 U	51
I	2.6 U	2.6	120	1.3 U	1.3 U	26	8.6	9	5	0.13 U	1.3 U	29	1.3 U	1.3 U	2.6 U	44
I	3.7 U	5.1	82	1.9 U	1.9 U	85	11	**98**	**54**	0.93	**37**	87	1.9 U	1.9 U	3.7 U	52
I	2.7 U	1.3 U	41	1.3 U	1.3 U	17	7	7.8	4.3	0.13 U	1.3 U	11	1.3 U	1.3 U	2.7 U	43
I	3.8 U	7.7	130	1.9 U	1.9 U	51	29	32	16	0.24	**21**	53	1.9 U	1.9 U	3.8 U	58
I	2.6 U	1.3 U	80	1.3 U	1.3 U	16	9.6	8.1	3.5	0.13 U	1.3 U	15	1.3 U	1.3 U	2.6 U	37
I	2.9 U	1.9	90	1.4 U	1.4 U	54	5.6	34	18	0.15 U	1.4 U	27	1.4 U	1.4 U	2.9 U	43
I	2.9 U	5.2	250	1.4 U	1.4 U	26	7.4	29	15	0.16	1.4 U	22	1.4 U	1.4 U	2.9 U	56
I	4.3 U	4.6	120	2.1 U	2.1 U	100	7.2	57	25	0.37	**13**	45	2.1 U	2.1 U	4.3 U	66
I	4.9 U	8	99	2.4 U	2.4 U	45	4.8	32	6	0.24 U	4.7	37	2.4 U	2.4 U	4.9 U	68
I	2.5 U	1.3 U	44 J	1.3 U	1.3 U	18 J	5.2	6.7	4	0.13 U	1.3 U	11 J	1.3 U	1.3 U	2.5 U	33 J
D	3 U	1.5 U	64 J	1.5 U	1.5 U	28 J	6.8	12	4.6	0.15 U	1.5 U	19 J	1.5 U	1.5 U	3 U	49 J
I	3.8 U	2.4	150	1.9 U	1.9 U	130	10	**70**	34	1.1	7	55	1.9 U	1.9 U	3.8 U	64
I	7.4 U	20	120	3.7 U	3.7 U	39	7.2	25	6.7	0.36 U	3.7 U	43	3.7 U	3.7 U	7.4 U	70
I	4.4 U	6.8	130	2.2 U	2.2 U	120	15	**71**	**53**	1.5	**76**	74	2.2 U	2.2 U	4.4 U	60
I	13 U	6.4 U	69	6.4 U	6.4 U	17	45	16	6.4 U	0.64 U	6.4 U	60	6.4 U	6.4 U	13 U	37
I	4.3 U	3.9	120	2.1 U	2.1 U	**240**	11	**130**	39	**0.57**	**95**	79	2.1 U	2.1 U	4.3 U	56
I	9.5 U	4.8 U	110	4.8 U	4.8 U	17	9.7	16	4.8 U	0.47 U	4.8 U	49	4.8 U	4.8 U	9.5 U	39
I	4 U	4.8	110	2 U	2 U	200	14	**130**	**47**	1.1	**24**	88	2 U	2 U	4 U	58
I	5 U	5	77	2.5 U	2.5 U	64	14	29	6.6	0.23 U	2.5 U	56 J	2.5 U	2.5 U	5 U	64
D	5.4 U	4.1	82	2.7 U	2.7 U	67	6.6	28	6.9	0.28 U	2.7 U	40 J	2.7 U	2.7 U	5.4 U	74
I	4.7 U	2.3 U	140	2.3 U	2.3 U	**220**	20	**100**	**49**	1.1	**32**	110	2.3 U	2.3 U	4.7 U	61
I	3.5 U	4.2	93	1.7 U	1.7 U	78	5.7	41	10	0.31	1.7 U	41	1.7 U	1.7 U	3.5 U	99
I	5.8 U	7.6	86	2.9 U	2.9 U	67	24	21	6.6	0.29 U	2.9 U	92	2.9 U	2.9 U	5.8 U	75
I	4.4 U	4.9	140	2.2 U	2.2 U	200	18	**130**	**46**	1	**67**	98	2.2 U	2.2 U	4.4 U	60
I	3.8 U	8.3	130	1.9 U	1.9 U	64	12	41	10	**0.46**	1.9 U	47	1.9 U	1.9 U	3.8 U	94
I	4.2 U	7.1	71	2.1 U	2.1 U	69	18	29	6.6	0.2 U	2.1 U	77	2.1 U	2.1 U	4.2 U	65
I	5.6 U	7.4	48	2.8 U	2.8 U	56	5.1	53	**51**	**0.52**	**23**	49	2.8 U	2.8 U	5.6 U	38
I	12 U	6.1 U	59	6.1 U	6.1 U	9.2	6.1 U	12 U	6.1 U	0.61 UJ	6.1 U	17	6.1 U	6.1 U	12 U	27
D	14 U	7.1 U	63	7.1 U	7.1 U	11	7.1 U	15	7.1 U	0.71 U	7.1 U	17	7.1 U	7.1 U	14 U	36
I	11 U	5.6 U	51	5.6 U	5.6 U	21	5.6 U	22	5.6 U	0.56 U	5.6 U	21	5.6 U	5.6 U	11 U	43
I	4.5 U	3.7	94	2.2 U	2.2 U	140	18	**84**	**44**	0.89	**110**	77	2.2 U	2.2 U	4.5 U	65
I	7 U	5.7	77	3.5 U	3.5 U	49	5.1	23	6	0.4	3.5 U	41	3.5 U	3.5 U	7 U	63
I	11 U	5.4 U	44	5.4 U	5.4 U	11	5.4 U	13	5.4 U	0.53 U	5.4 U	16	5.4 U	5.4 U	11 U	36

Metals (mg/Kg)

y:[1]	NE	29	386	1	1.2	217	30	68.1	43.2	0.43	9.3	129	3.5	1	2.5	125
n:	**NE**	**41.6**	**459**	**NE**	**9.6**	**370**	**42.6**	**270**	**218**	**0.71**	**23,000**	**516**	**33**	**3.7**	**NE**	**NE**
ple pe	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**
I	3.8 U	1.9 U	86	1.9 U	1.9 U	180	10	**99**	40	**0.65**	**28**	72	1.9 U	1.9 U	3.8 U	67
I	7.2 U	5.1	77	3.6 U	3.6 U	53	5.3	25	5.2	0.36 U	3.6 U	35	3.6 U	3.6 U	7.2 U	63
I	10 U	5 U	68	5 U	5 U	15	6.6	11	5 U	0.51 U	5 U	19	5 U	5 U	10 U	32
I	4.1 U	2.1 U	120	2.1 U	2.1 U	**240**	17	**120**	28 1.6		**30**	98	2.1 U	2.1 U	4.1 U	68
I	9.5 U	4.7 U	97	4.7 U	4.7 U	46	4.7 U	20	5.8	0.47 U	4.7 U	25	4.7 U	4.7 U	9.5 U	61
I	13 U	6.7 U	70	6.7 U	6.7 U	14	6.7 U	13 U	6.7 U	0.63 U	6.7 U	24	6.7 U	6.7 U	13 U	33
D	12 U	5.9 U	64	5.9 U	5.9 U	14	5.9 U	13	5.9 U	0.57 U	5.9 U	19	5.9 U	5.9 U	12 U	31
I	4.2 U	2.8	120	2.1 U	2.1 U	180	15	**140**	**46**	1.3	**22**	82	2.1 U	2.1 U	4.2 U	67
I	12 U	6.2 U	60	6.2 U	6.2 U	10	6.2 U	16	6.2 U	0.61 U	6.2 U	16	6.2 U	6.2 U	12 U	32
I	7.9 U	7.9	69	4 U	4 U	67	6.2	66	**89**	0.88	**19**	66	4 U	4 U	7.9 U	62
I	12 U	6.1 U	78	6.1 U	6.1 U	30	6.1 U	13	6.1 U	0.6 U	6.1 U	22	6.1 U	6.1 U	12 U	50
I	5.3 U	4.6	120	2.7 U	2.7 U	110	18	**77**	**45**	0.9	**76**	75	2.7 U	2.7 U	5.3 U	71
D	4.2 U	7.8	96	2.1 U	2.1 U	150	11	**85**	43 1		**37 J**	71	2.1 U	2.1 U	4.2 U	60
I	13 U	6.6 U	47	6.6 U	6.6 U	17	6.6 U	16	6.6 U	0.65 U	6.6 U	19	6.6 U	6.6 U	13 U	33
I	4.4 U	7.4	96	2.2 U	2.2 U	180	9.9	**97**	43 1		**49 J**	75	2.2 U	2.2 U	4.4 U	63
I	13 U	6.4 U	70	6.4 U	6.4 U	17	6.4 U	14	6.4 U	0.63 U	6.4 U	26	6.4 U	6.4 U	13 U	33
I	6.8 U	3.4 U	52	3.4 U	3.4 U	44	5.4	43	**66**	0.33	**10**	39	3.4 U	3.4 U	6.8 U	45
I	14 U	7 U	48	7 U	7 U	15	7 U	14 U	7 U	0.67 U	7 U	19	7 U	7 U	14 U	28
I	13 U	6.4 U	46	6.4 U	6.4 U	15	6.4 U	13 U	6.4 U	0.62 U	6.4 U	21	6.4 U	6.4 U	13 U	33
I	4.7 U	2.3 U	73	2.3 U	2.3 U	130	12	**88**	**47**	**0.48**	**56**	75	2.3 U	2.3 U	4.7 U	63
I	14 U	7 U	100	7 U	7 U	11	7 U	14 U	7 U	0.68 U	7 U	18	7 U	7 U	14 U	31
I	11 U	5.5 U	54	5.5 U	5.5 U	15	5.5 U	11	5.5 U	0.75	5.5 U	17	5.5 U	5.5 U	11 U	37
I	11 U	9.1	69	5.3 U	5.3 U	47	7	**75**	**89**	0.53 U	**9.7**	56	5.3 U	5.3 U	11 U	55
I	12 U	6 U	46 J	6 U	6 U	13	6 U	12 U	6 U	0.6 U	6 U	17	6 U	6 U	12 U	31
D	13 U	6.4 U	62 J	6.4 U	6.4 U	9.4	6.4 U	13 U	6.4 U	0.63 U	6.4 U	15	6.4 U	6.4 U	13 U	23
I	12 U	6.1 U	36	6.1 U	6.1 U	9.8	6.1 U	12 U	6.1 U	0.61 U	6.1 U	19	6.1 U	6.1 U	12 U	30
I	7.7 U	3.8 U	84	3.8 U	3.8 U	97	8.7	**78**	**83**	**0.57**	**58**	76	3.8 U	3.8 U	7.7 U	72
I	14 U	6.8 U	62	6.8 U	6.8 U	9.5	6.8 U	14 U	6.8 U	0.64 U	6.8 U	15	6.8 U	6.8 U	14 U	21
I	4.2 U	2.1 U	130	2.1 U	2.1 U	**230**	11	**120**	**55**	0.95	**21**	93	2.1 U	2.1 U	4.2 U	70
I	14 U	6.8 U	78	6.8 U	6.8 U	14	6.8 U	16	6.8 U	0.65 U	6.8 U	19	6.8 U	6.8 U	14 U	29
I	10 U	5.1 U	130	5.1 U	5.1 U	28	5.1 U	17	5.1 U	0.48 U	5.1 U	26	5.1 U	5.1 U	10 U	44
I	4.6 U	2.4	74	2.3 U	2.3 U	120	7.9	**85**	**49**	0.86	**32**	60	2.3 U	2.3 U	4.6 U	50
I	14 U	7.1 U	62	7.1 U	7.1 U	12	7.1 U	14 U	7.1 U	0.71 U	7.1 U	21	7.1 U	7.1 U	14 U	32
D	12 U	6.1 U	56	6.1 U	6.1 U	14	6.1 U	12 U	6.1 U	0.61 U	6.1 U	20	6.1 U	6.1 U	12 U	25
I	5.1 U	2.6 U	140	2.6 U	2.6 U	**310**	15	**130**	**51**	1.1	**48**	110	2.6 U	2.6 U	5.1 U	96
I	12 U	6 U	65	6 U	6 U	18	6 U	16	6 U	0.6 U	6 U	20	6 U	6 U	12 U	34
I	4.5 U	2.3 U	100	2.3 U	2.3 U	**250**	12	**140**	**54**	1.3	**26**	89	2.3 U	2.3 U	4.5 U	63
I	6.5 U	8.9	39	3.3 U	3.3 U	44	5.8	47	**45**	0.23 U	3.3 U	41	3.3 U	3.3 U	6.5 U	56
	4.9 U	3.5 U	58	3.5 U	3.5 U	[illegible]	8.7	**80**	40 0.31		**50**	59	3.5 U	3.5 U	4.9 U	47

Metals (mg/kg)

y: [1]	NE	29	386	1	1.2	217	30	68.1	43.2	0.43	9.3	129	3.5	1	2.5	125
n:	NE	41.6	459	NE	9.6	370	42.6	270	218	0.71	23,000	516	33	3.7	NE	NE
ple pe	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium
I	8.1 U	11	120	4 U	4 U	190 J	**39 J**	**100**	**57 J**	**0.65**	**140 J**	**150 J**	4 U	4 U	8.1 U	86
D	8.7 U	8	110	4.4 U	4.4 U	150 J	**31 J**	**86**	**44 J**	0.44 U	**70 J**	110 J	4.4 U	4.4 U	8.7 U	77
I	11 U	5.3 U	58	5.3 U	5.3 U	46	7.6	22	5.3 U	0.53 U	5.3 U	47	5.3 U	5.3 U	11 U	72
I	12 U	20	75	6.2 U	6.2 U	37	8.5	19	6.2 U	0.62 U	6.2 U	40	6.2 U	6.2 U	12 U	84
I	4.2 U	2.6	92	2.1 U	2.1 U	200	12	**170**	**60**	1.9	**33**	95	2.1 U	2.1 U	4.2 U	58
I	11 U	9.2	49	5.4 U	5.4 U	23	5.4 U	18	9.4	0.21 U	5.4 U	35	5.4 U	5.4 U	11 U	40
I	5.8 U	4.7	110	2.9 U	2.9 U	64	10	25	8.7	0.29 U	2.9 U	51	2.9 U	2.9 U	5.8 U	87
I	6 U	12	75	3 U	3 U	48	13	29	8.7	**0.46**	3 U	51	3 U	3 U	6 U	68
I	3.9 U	9.6	62	2 U	2 U	59	12	41	18	0.23	2 U	56	2 U	2 U	3.9 U	59
I	13 U	6.4 U	74	6.4 U	6.4 U	45	8	23	6.4 U	0.65 U	6.4 U	45	6.4 U	6.4 U	13 U	74
D	14 U	8.2	80	7.1 U	7.1 U	48	8.3	26	7.1 U	0.72 U	7.1 U	54	7.1 U	7.1 U	14 U	74
I	12 U	6.1 U	79	6.1 U	6.1 U	57	7.6	25	6.2	0.63 U	6.1 U	53	6.1 U	6.1 U	12 U	76
I	6.9 U	6	73	3.4 U	3.4 U	65	14	46	18	0.35 U	3.4 U	67	3.4 U	3.4 U	6.9 U	71
I	15 U	9.6	57	7.4 U	7.4 U	22	9.2	17	7.4 U	0.77 U	7.4 U	40	7.4 U	7.4 U	15 U	54
I	8 U	8.2	93	4 U	4 U	90	18	62	24	0.4 U	4 U	84	4 U	4 U	8 U	94
I	5.6 U	6.6	91	2.8 U	2.8 U	80	15	31	9.4	0.27 U	2.8 U	76	2.8 U	2.8 U	5.6 U	84
I	4.2 U	4.5	78	2.1 U	2.1 U	79	17	31	7.8	0.21 U	2.1 U	80	2.1 U	2.1 U	4.2 U	78
I	14 U	7 U	55	7 U	7 U	33	7 U	24	7 U	0.7 U	7 U	34	7 U	7 U	14 U	53
I	14 U	9	59	7.1 U	7.1 U	35	12	19	7.1 U	0.71 U	7.1 U	48	7.1 U	7.1 U	14 U	57
I	15 U	7.6 U	65	7.6 U	7.6 U	29	7.6 U	23	7.6 U	0.75 U	7.6 U	25	7.6 U	7.6 U	15 U	36
I	14 U	9.5	56	7.2 U	7.2 U	14	7.2 U	14 U	7.2 U	0.72 U	7.2 U	19	7.2 U	7.2 U	14 U	28
I	18 U	8.9 U	45	8.9 U	8.9 U	16	8.9 U	18 U	8.9 U	0.89 U	8.9 U	19	8.9 U	8.9 U	18 U	32
I	16 U	7.8 U	46	7.8 U	7.8 U	12	7.8 U	17	7.8 U	0.77 U	7.8 U	17	7.8 U	7.8 U	16 U	27
I	15 U	7.5 U	29	7.5 U	7.5 U	8.9	7.5 U	15 U	7.5 U	0.76 U	7.5 U	12	7.5 U	7.5 U	15 U	11
I	17 U	8.4 U	48	8.4 U	8.4 U	8.4 U	8.4 U	17 U	8.4 U	0.84 U	8.4 U	11	8.4 U	8.4 U	17 U	16
I	18 U	9 U	30	9 U	9 U	9 U	9 U	18 U	9 U	0.88 U	9 U	13	9 U	9 U	18 U	18
D	18 U	9 U	31	9 U	9 U	9	9 U	18 U	9 U	0.87 U	9 U	12	9 U	9 U	18 U	16
I	5.5 U	6.5	40	2.8 U	2.8 U	32	8.4	23	6.8	0.27 U	2.8 U	36	2.8 U	2.8 U	5.5 U	38
I	14 U	6.9 U	41	6.9 U	6.9 U	24	6.9 U	15	6.9 U	0.68 U	6.9 U	28	6.9 U	6.9 U	14 U	42
I	5.8 U	3.9	130	2.9 U	2.9 U	210	12	280	**61**	1.4	2.9 U	110	2.9 U	2.9 U	5.8 U	65
I	9.2 U	4.6 U	77	4.6 U	4.6 U	58	6.6	24	6	0.46 U	4.6 U	49	4.6 U	4.6 U	9.2 U	68
I	8.2 U	4.1 U	70	4.1 U	4.1 U	54	6.2	26	5.8	0.4 U	4.1 U	44	4.1 U	4.1 U	8.2 U	62
I	4.1 U	2.1 U	83	2.1 U	2.1 U	150	7.4	**78**	40	**0.71**	2.1 U	53	2.1 U	2.1 U	4.1 U	46
I	6.8 U	8	73	3.4 U	3.4 U	57	18	28	6.1	0.34 U	3.4 U	72	3.4 U	3.4 U	6.8 U	71
I	7.1 U	11	68	3.5 U	3.5 U	65	21	28	6.7	0.35 U	3.5 U	82	3.5 U	3.5 U	7.1 U	82
I	4.3 U	6	110	2.2 U	2.2 U	30	13	**170**	290 1.1		**12**	**210**	2.2 U	2.2 U	4.3 U	21
I	4.5 U	6.5	100	2.3 U	2.3 U	89	9.8	**70**	**61**	0.77	5.2	64	2.3 U	2.3 U	4.5 U	45
I	14 U	12	120	7.1 U	7.1 U	29	18	30	8	0.71 U	7.1 U	73	7.1 U	7.1 U	14 U	74

Metals (mg/kg)

y: [1]	NE	29	386	1	1.2	217	30	68.1	43.2	0.43	9.3	129	3.5	1	2.5	125
h:	NE	41.6	459	NE	9.6	370	42.6	270	218	0.71	23,000	516	33	3.7	NE	NE
ple pe	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium
l	7.1 UJ	5.7	65	3.5 U	3.5 U	46	7.5	65	**75**	0.36	3.5 U	80	3.5 U	3.5 U	7.1 U	50
l	8 U	6.5	88	4 U	4 U	89	8.4	61	**59**	**0.61**	**22**	60	4 U	4 U	8 U	60
l	7.9 U	9.6	110	4 U	4 U	62	8.4	52	33	**0.47**	4 U	47	4 U	4 U	7.9 U	68
l	5 U	3.3	99	2.5 U	2.5 U	170	11	**130**	**51**	0.42	**25**	72	2.5 U	2.5 U	5 U	57
l	5.3 U	4.6	100	2.7 U	2.7 U	120	8.8	**80**	38	**0.44**	8.9	58	2.7 U	2.7 U	5.3 U	52
l	5.2 UJ	7.4	170 J	2.6 U	2.6 U	130	19	**91**	**47**	**0.65**	**30**	84	2.6 U	2.6 U	5.2 U	73
l	4.6 U	5.3	240	2.3 U	2.3 U	47	6.2	43	32	0.22 U	2.3 U	29	2.3 U	2.3 U	4.6 U	67
l	3.3 U	4.9	120	1.6 U	1.6 U	38	14	39	20	0.21	**35**	41	1.6 U	1.6 U	3.3 U	44

Cleanup Goals (Eco PCG) Low and High are Eco PCGs using Source Hierarchy. The main categories (Background Values, Sediment Goals) developed for the site were listed in order of highest to lowest priority. Sources within each category were also listed in hierarchical qually however, area-weighted values are not considered. If a value is not available in the highest priority source, then the next source is

archy Ecological Preliminary Cleanup Goals (Eco PCG) Low are bolded, detected results greater than the Eco PCG High are circled

mit

ated by laboratory or data validation

TABLE A-3

Sediment Sampling Analytical Results, Total Petroleum Hydrocarbons

Summary of Findings Associated with Shell Pond Surveying and Sediment Sampling

Shell Pond, Bay Point, California

Location	Date	Depth (ft bgs)	Sample Type	Total Petroleum Hydrocarbons (mg/kg) TPH as diesel	TPH as gasoline	TPH as motor oil
Sediment Samples						
SP-C101	03/19/10	0-0.6	N	6,900 J	2 U	6,100
	03/19/10	0-0.6	FD	3,400 J	6.6 J	3,700
	03/19/10	2-2.5	N	24	1.4 U	13 U
SP-C102	03/19/10	0-0.5	N	36 1.2	U	33
	03/19/10	1-1.5	N	15 0.97	U	14
SP-C103	03/19/10	0-0.5	N	9,700 2.3	UJ	7,900
	03/19/10	1.5-1.75	N	23	1.2 U	13 U
SP-C104	03/19/10	0-0.75	N	51,000 J	380	25,000 J
	03/19/10	1.75-2.25	N	17	1.4 U	13 U
SP-C105	03/19/10	0-0.5	N	590 2	.5 U	850
	03/19/10	1.5-1.75	N	17	1.3 U	13 U
SP-C106	03/23/10	0-1	N	1,900 1.8	U	1,700
	03/23/10	1.25-1.5	N	39 1.5	U	48
SP-C107	03/19/10	0-0.75	N	11,000 3.4	UJ	7,400
	03/19/10	1.75-2.25	N	55 3.7	U	51
	03/19/10	2.75-3.25	N	28 1.4	U	27
	03/19/10	2.75-3.25	FD	24 1.4	UJ	20
SP-C108	03/23/10	0-0.75	N	3,100 2.6	U	3,600
	03/23/10	2.25-2.75	N	110 6.2	U	62
SP-C109	03/19/10	0-0.75	N	14,000 4.4		11,000
	03/19/10	1.25-1.75	N	110 1	0 U	130
SP-C110	03/23/10	0-0.75	N	14,000 3.1	U	8,100
	03/23/10	2.75-3.25	N	220 7	.5 U	130
SP-C111	03/23/10	0-0.5	N	19,000 2.5	U	10,000
	03/23/10	2.25-2.5	N	73 3.5	U	44
	03/23/10	2.25-2.5	FD	61 4	U	48
SP-C112	03/22/10	0.25-1.25	N	26,000 240		19,000
	03/22/10	1.75-2.25	N	69 2.1	U	61
	03/22/10	3-3.5	N	140 4.3	U	76
SP-C113	03/23/10	0.25-1.25	N	40,000 3	U	14,000
	03/23/10	2.5-3	N	33	2.4 U	19 U
	03/23/10	4-4.5	N	57 2.8	U	28
SP-C114	03/22/10	0-0.5	N	920 3	.6 U	780
	03/22/10	2.25-2.75	N	200 12	U	93
	03/22/10	2.25-2.75	FD	130 14	U	77
	03/22/10	4.25-4.75	N	99 9.5	U	57
SP-C115	03/23/10	0-0.6	N	56,000 J	3.2 U	38,000 J

TABLE A-3
Sediment Sampling Analytical Results, Total Petroleum Hydrocarbons
Summary of Findings Associated with Shell Pond Surveying and Sediment Sampling
Shell Pond, Bay Point, California

Location	Date	Depth (ft bgs)	Sample Type	Total Petroleum Hydrocarbons (mg/kg) TPH as diesel	TPH as gasoline	TPH as motor oil
Sediment Samples						
SP-C115	03/23/10	2.25-2.75	N	110 5.9	U	42
	03/23/10	3.25-3.75	N	200 9.7	U	73
SP-C116	03/23/10	0.25-0.75	N	4,200 2.9	U	3,500
	03/23/10	2-2.5	N	81 3.8	U	43
	03/23/10	4.25-4.75	N	94	5.3 U	51 U
SP-C117	03/22/10	0.25-0.75	N	31,000 2.7	U	12,000
	03/22/10	1.25-1.75	N	130 11	J	70
	03/22/10	3.25-3.75	N	240 1	2 U	250
	03/22/10	3.25-3.75	FD	260 1	1 U	230
SP-C118	03/23/10	0-0.5	N	3,200 3.6		4,200
	03/23/10	2-2.5	N	210 10	U	97
SP-C119	03/22/10	0-0.3	N	26,000 4.8	U	22,000
	03/22/10	1.75-2	N	170 1	1 U	180
SP-C120	03/23/10	0-0.6	N	680 3	.2 U	780
	03/23/10	0-0.6	FD	6,900 J	2.8 U	4,500 J
	03/23/10	2.75-3.25	N	310 1	1 U	130
SP-C121	03/23/10	0.25-0.75	N	18,000 J	3.1 U	9,400 J
	03/23/10	2.75-3.25	N	170 1	3 U	180
SP-C122	03/22/10	0-0.5	N	1,500 5.2	U	1,900
	03/22/10	1.75-2	N	170 1	2 U	220
	03/22/10	3-3.5	N	190 1	1 U	140
SP-C123	03/23/10	0-0.5	N	9,500 J	3.8 J	7,100 J
	03/23/10	1.75-2.25	N	180 1	2 U	120
	03/23/10	3.25-3.75	N	360 9	.8 U	160
SP-C124	03/19/10	0-0.5	N	6,000 8.3	UJ	7,100
	03/19/10	1.75-2.25	N	170 1	1 U	140
	03/19/10	1.75-2.25	FD	100 J	11 U	64 U
	03/19/10	3.2-3.7	N	100	10 U	90 J
SP-C125	03/22/10	0.25-0.75	N	8,100 5.9	U	7,300
	03/22/10	2-2.5	N	200 1	2 U	180
SP-C126	03/22/10	0.25-0.75	N	16,000 3	UJ	11,000
	03/22/10	1.75-2.25	N	180 1	1 U	160
	03/22/10	3.25-3.75	N	87 8.8	U	140
SP-C127	03/19/10	0-0.75	N	12,000 3.7	UJ	8,600
	03/19/10	2-2.5	N	320 1	0 U	270
	03/19/10	2-2.5	FD	250 1	1 U	130
SP-C128	03/22/10	0.25-0.75	N	4,700 3.6	U	4,900
	03/22/10	1.75-2.25	N	110 8.9	U	83

TABLE A-3
Sediment Sampling Analytical Results, Total Petroleum Hydrocarbons
Summary of Findings Associated with Shell Pond Surveying and Sediment Sampling
Shell Pond, Bay Point, California

Location	Date	Depth (ft bgs)	Sample Type	Total Petroleum Hydrocarbons (mg/kg) TPH as diesel	TPH as gasoline	TPH as motor oil
Sediment Samples						
SP-C129	03/18/10	0.25-1.25	N	24,000 7.8	J	22,000 J
	03/18/10	1.25-1.75	N	290 5	.2 U	170
SP-C130	03/22/10	0-0.5	N	640 3	.3 U	740
	03/22/10	1.75-2	N	69 11	U	110
SP-C131	03/22/10	0.25-0.75	N	1,400 6	U	1,300
	03/22/10	0.25-0.75	FD	2,000 6.2	U	2,000
	03/22/10	1.75-2.25	N	400 9	.2 U	250
	03/22/10	5-5.5	N	430 1	0 U	270
SP-C132	03/18/10	0-0.75	N	25,000 31	J	25,000
	03/18/10	1.2-1.75	N	410 1	1 U	180
SP-C133	03/26/10	0.25-0.75	N	110 3	.9 U	150
	03/26/10	2.25-2.75	N	120 4	.7 U	140
SP-C134	03/26/10	0-0.5	N	99 2.8	U	110
	03/26/10	1-1.5	N	570 1	1 U	770
	03/26/10	1-1.5	FD	730 1	3 U	990
	03/26/10	2.25-2.75	N	730 1	0 U	1,200
SP-C135	03/26/10	0-1	N	140 4	.5 U	180
	03/26/10	1.75-2.25	N	830 1	3 U	1,500
SP-C136	03/26/10	0-1	N	130 6	U	200
	03/26/10	1.5-1.75	N	140 4	U	100
	03/26/10	2.5-2.75	N	40 2.9	U	44
SP-C137	03/26/10	0-0.5	N	210 1	2 U	280
	03/26/10	1.75-2	N	430 1	2 U	490
SP-C138	03/26/10	0-1	N	170 1	3 U	210
	03/26/10	1.75-2	N	510 1	3 U	870
SP-C139	03/26/10	0.25-0.75	N	350 1	6 U	560
	03/26/10	1.25-1.75	N	270 1	4 U	340
SP-C140	03/26/10	0-0.5	N	190 1	3 U	130
	03/26/10	1.25-1.75	N	280 1	4 U	370
SP-C141	03/25/10	0-1	N	350 1	6 U	440
	03/25/10	0-1	FD	390 1	5 U	500
SP-C142	03/25/10	0-1	N	79 3.9	U	95
	03/25/10	0.75-1.25	N	210 1	2 U	270
SP-C201	03/29/10	1-1.5	N	29,000 360		20,000
	03/29/10	3-3.5	N	160 6	.7 U	160
	03/29/10	4-4.5	N	73 6.3	U	68
SP-C202	03/29/10	0.25-0.75	N	56,000 810		16,000

TABLE A-3

Sediment Sampling Analytical Results, Total Petroleum Hydrocarbons

Summary of Findings Associated with Shell Pond Surveying and Sediment Sampling

Shell Pond, Bay Point, California

Location	Date	Depth (ft bgs)	Sample Type	Total Petroleum Hydrocarbons (mg/kg)		
				TPH as diesel	TPH as gasoline	TPH as motor oil
Sediment Samples						
SP-C202	03/29/10	2.25-2.75	N	110 5	.6 U	120
	03/29/10	4-4.5	N	60 5.4	U	55
SP-C203	03/29/10	1.5-1.75	N	54,000 2,600		25,000
SP-C204	03/30/10	0.25-0.75	N	27,000 --	-	13,000
	03/30/10	2-2.5	N	330 -	--	420
Composite Samples						
SP-CS001	03/26/10	0-1.5	N	350 7	.5 U	240
SP-CS002	03/26/10	0-1.5	N	130 2	.6 U	180
SP-CS003	03/22/10	0-1.5	N	270 3	.7 U	170
SP-CS004	03/19/10	0-1.5	N	950 5	.6 U	490
SP-CS005	03/23/10	0-1.5	N	720 4	U	600
SP-CS006	03/22/10	0-1.5	N	13,000 18		5,900
SP-CS007	03/23/10	0-1.5	N	8,800 410		3,300
SP-CS008	03/22/10	0-1.5	N	14,000 3.1	U	5,600
SP-CS009	03/23/10	0-1.5	N	2,200 6.4		2,300
SP-CS010	03/19/10	0-1.5	N	1,800 1.7	U	2,200

Notes:

mg/kg milligrams per kilogram

ft bgs feet below ground surface

N primary sample

FD field duplicate

--- not analyzed

U not detected at the listed reporting limit

J concentration or reporting limit estimated by laboratory or data validation

Appendix B
Cost Analysis of Alternatives Evaluated for Shell Pond

APPENDIX B

Alternatives Cost Analysis – Shell Pond Remedy Modification

This appendix presents information on the development of rough order of magnitude (ROM) construction costs for the alternatives presented in this report and the cost ranges summarized in Table 3-1.

The summary cost estimates included in this appendix were prepared based on the information available at the time of the estimate. The estimates and ranges presented in Table 3-1 in the main body of this Corrective Measures Study are intended for use in comparative analysis of the alternatives. The final cost of the project will depend on final design, selected scope of work, actual labor and material costs, competitive market conditions, implementation schedule, and other variable factors. As a result, the final project costs will vary from the budgetary estimate presented herein. These estimates cannot be relied upon to establish funding levels, as neither preliminary nor design engineering has been performed in sufficient detail to provide quantities from which to estimate. In addition, the scope of the project, design, and methodology for performing the work have not been determined and would have an impact upon the ultimate cost of the project. Variations in some elements (quantity of removed material and cover options in particular) were used to provide an indication of the sensitivity and variability in the total ROM costs.

Costs not included in the estimates include:

- Planning, design and permitting costs (these costs are significant but do not likely differ significantly among Alternatives 2, 3, 4 and 5)
- Costs to develop the site for end use other than open-space/wetlands restoration
- Internal PG&E costs
- Costs for regulatory agency oversight
- Costs for implementation of biological monitoring or other permit conditions that may be imposed by the resource agencies
- Waste generator taxes and fees for offsite disposal of materials

ROM estimates were produced using one or more of the following methods:

- Estimates provided to PG&E by other consultants
- Comparison with similar work performed by contractors, with material and labor adjustments based on observed or perceived site conditions
- Equipment costs for similar facilities, with adjustments for site conditions

- Ratio methods, using known material/equipment costs as guides
- Contacting vendors or suppliers to obtain ROM unit costs

The ROM estimates include construction, construction management and testing/disposal.

The effectiveness, implement ability, and cost for the removal alternatives depend on several key components:

- Accessibility and ease of accessibility to the impacted non-native material
- Quantity of material removed
- Quantity of fill/cover material needed
- Material dewatering
- Water treatment
- Odor and dust
- CEQA mitigations
- Resource permit conditions

B.1 Cost Sensitivities

The major cost items and estimates of the variability in the assumptions for these costs were assessed. The following describes the key cost variables and sensitivities considered in this evaluation. The weight of these variables on the total cost of the alternatives varies. For example, the costs for Alternative 5 – complete removal and offsite disposal are most sensitive to the volume and tonnage of material to be removed.

- **Target Remediation Goal:** This evaluation uses a goal of removal of non-native material deposited by past industrial wastewater discharges to estimate excavation quantities. Use of different remediation targets could significantly change this volume and associated costs.

- **Quantity of Impacted Non-Native Material Requiring Removal**: The quantity of impacted non-native material is less than the estimated removal quantity used in the estimates. A range in removal quantities was considered based on our experience and judgment as to the precision of the equipment used for removal. There is also a relatively large uncertainty in quantity estimates for earth materials removal. Increases of 30 to 50 percent for removal are not uncommon; some of this is due to the limitations of excavation equipment (removal is not very precise/surgical) and some is attributed to extrapolation of soil sample results vertically and horizontally. The quantity of materials that is estimated to be removed based on chemical analysis results differs from the lithologic-based quantity estimates. Various quantity estimates have been prepared for Shell Pond. Based on recent investigation the estimated volume of impacted material based on visual identification is approximately 150,000 in-situ cubic yards. Based on a plan view conceptual removal plan an estimate of 180,000 in-situ cubic yards of impacted material would be removed. Because removal is not surgical it is estimated that an average of 6 inches of material would be removed in order to remove the impacted non-native material. Six inches over 73 acres is approximately 60,000 in-situ cubic yards. The cost summaries in this appendix assumed 240,000 cubic yards would be removed under Alternatives 3 and 5. A range in costs for these alternatives is based on a removal of 180,000 to 300,000 in-situ cubic yards.

- **Method of Removal**: It is assumed that the impacted non-native material in the southernmost approximately 8 acres of the pond would be removed mechanically with conventional excavation equipment. Hydraulic horizontal auger dredge removal would occur in the remaining 65 acres of the pond. The depth of water in the pond may limit the ability to implement the hydraulic removal and additional water may need to be added from the western slough to implement this method.
- **Transportation and Disposal:** Transportation and disposal rates are based on the weight of the material in tons. For purposes of this cost analysis one cubic yard of in-situ material weighs 1.25 tons. The actual conversion may differ depending on the amount of stabilizers that may be required for the sediment and the specific gravity of the material. The dewatered volume of material is expected to be less than in-situ volume; however, the conversion to tons would be expected to be greater than 1.25 tons/cubic yard. The cost for disposal in these estimates is based on rates provided by a contractor and assumes disposal at Keller Canyon Landfill as Class 2 material. The actual rate and transportation costs may vary depending on a number of factors including fuel prices, landfill capacity, and changes in acceptance criteria, among others.
- **Required Cover System:** Alternatives 2, 3, and 4 assume that imported material will be needed for cover or capping. Alternative 5 assumes material for cover on the Carbon Black Area can be obtained from the upland area west of the Shell Pond. The availability of on-site and local material will affect the actual costs of these alternatives. In addition, the design of the cover can also have a significant impact on the actual costs. Alternative covers consisting of 1 foot of vegetative cover and geosynthetic clay liner overlain by 1 foot of vegetative cover were considered for Alternatives 2, 3, and 4. In addition, a geosynthetic clay with synthetic drainage layer and 2 feet of vegetative cover was considered (Alternatives 3c and 3d) in developing a range of costs for Alternative 3, Consolidation in the Carbon Black Area.
- **Water Treatment:** The need for and type of water treatment is uncertain but will be evaluated as part of bench and pilot testing. For Alternatives 3, 4 and 5, a cost of $2.3 million dollars was assumed based on our experience. The amount of water that could require treatment was not estimated. If water treatment is necessary then several options would be considered, including modifying the removal methods to minimize the amount of water requiring treatment, evaluating the costs for on-site treatment, and evaluating the costs for discharge to the sanitary sewer near the site.

B.2 Key Assumptions for Cost Estimation

The following are key condition assumptions relevant to development and costing of the various remedial alternatives:

- Temporary access road: 4,250 linear feet, approximately 15 feet wide and includes temporary manufactured bridge.
- Area of the Shell Pond: 73 acres (3,180,000 square feet).

- Thickness and volume of the Shell Pond impacted non-native material: 0.5 to 2.5 feet; 180,000 cubic yards (CH2M HILL, in preparation).
- Removal volume: 180,000 to 300,000 in-situ cubic yards. Base cost estimates assume 240,000 cubic yards.
- Tons for transportation and disposal: Tons calculated as 1.25 tons/cubic yard of in-situ material.
- Hydraulic removal will be used for removal of 209,000 in-situ cubic yards in 65 acres of the Shell Pond and mechanical removal will be used for 8 acres in the south end of pond.
- Non-native impacted material and underlying peat and bay mud are soft and may not support conventional removal equipment or additional fill without significant settlement. Swamp mats, low-pressure equipment, and geogrids may be needed to mitigate the impacts of soft sediments during and after construction.
- Impacted non-native material is classified as a Class II non-hazardous waste.
- Odors and dust may be generated by pond sediment during dry summer months so odor and dust controls will be necessary.

B.2.1 Alternative 1 – Wet Cover

The costs of this alternative are based on an estimated provided by AMEC to PG&E in 2008.

B.2.2 Alternative 2 – Cover Sediments In-Place

Two cover options were considered: a) a 1-foot soil cover over the entire 73-acre pond, and b) a cover consisting of a foundation layer (2 feet), low-permeability geosynthetic clay liner and 1 foot of vegetative cover. To develop ROM conceptual costs for these options, the following design and quantity assumption were used:

- Area of cover: 73 acres or 3,180,000 square feet.
- Volume of import soil material for 1-foot cover: 117,800 cubic yards.
- Amount of low permeability geosynthetic liner (FML or GCL) to install: 3,180,000 sf.
- Water on pond and sediments will be allowed to dry out naturally.
- Placement of import will require low-pressure equipment.
- Little or no grading of underlying sediment will be performed.
- Operation and maintenance costs are not included.
- Construction can be performed during a 2-3 month period.
- No soil will be disposed of off-site.

The total ROM cost is $10 million (M) to $20M. Filling and grading accounts for the major cost for this alternative.

B.2.3 Alternatives 3, 4 and 5 – Removal and Consolidation or Offsite Disposal of Sediment

The main difference among the alternatives is the quantities and areas associated with the construction.

Hydraulic Dredging

The major elements of work associated with the hydraulic dredging alternative are summarized below:

- Maintain or increase the water level within the Shell Pond to ensure enough water for effective hydraulic dredging.
- Clear and grub/build access to areas necessary to access the pond for dredging and to remove large debris and sediment from the pond.
- Construct an engineered high-density polypropylene (HDPE; or similar)-lined dewatering cell with berms in the upland areas to the south, west and east of the Shell Pond.
- Remove sediment and debris from the perimeter near shore using a low ground-pressure land-based excavator; stockpile the sediment and debris on the shelf. Prior to shelf excavation, silt curtains/turbidity barrier will be installed along the edge of the shelf to prevent runoff directly into the adjacent sloughs and Honker Bay.
- Treatability trials testing will be performed to determine elutriate quality from the dredging trials. This will determine the combinations of unit processes such as pre-settling, coagulation, flocculation, sedimentation, filtration and granular activated carbon adsorption needed to produce the required treated water specification.
- Remove approximately 209,000 cubic yards of sediment using a hydraulic 8-inch cutterhead dredge.
- Hydraulically transfer dredged sediments to the Geotube® header system located within the containment area where dewatering polymer will be injected in-line at a rate of 200 to 350 parts per million (ppm), pumped into the Geotubes® and allowed to passively dewater.
- Collect Geotube® weep water and rainwater, treat via sand filtration to meet total suspended solids loading of less than 50 nephelometric turbidity units (NTU), pH adjustment, and discharge back to the pond.
- Geotubes® will be allowed to dewater passively until desired dewatering levels are achieved (passing paint filter test). Based on bench-testing data, this is estimated to require 30 to 60 days. Geotube® core samples will be collected on a weekly basis to track the dewatering rates.
- Upon reaching asymptotic dewatering levels, the Geotube® will be opened and the dewatered sediment and debris loaded for transport in Visqueen™-lined dump trucks to the approved landfill (Alternative 5). For Alternatives 2 and 3 the containment area will be constructed in the consolidation area so that the material will not be removed from the Geotubes®.
- Trucks will be scheduled to minimize neighborhood traffic disruption and excessive idle times during staging and loading. Prior to loading, each transport truck will be visually inspected for cleanliness and safety compliance and a liner will be installed and staged for loading. Any truck failing inspection will be rejected and sent offsite immediately.

After loading, each truck will be swept clean or pressure washed to remove of any loose material on the sides and wheels, tarped, and inspected for security and safety prior to release from the site.

- The areas of sediment removal will not require backfilling. However, some grading and placement of levee material will be performed in areas where the levee is breached. Costs for this minor grading are part of the estimated cost of $5,000 per acre for wetland restoration. No import backfill is assumed.
- For Alternatives 3 and 4, two cover alternatives were considered: a) import and placement of one foot of soil cover, and b) a geosynthetic liner and then 1 foot of fill material to cover the sediment placed in the consolidation area.
- Restore the site to include removal of excess material and demobilization of all personnel, equipment, materials, and supplies utilized to complete the work.
- Restore wetlands and transition zones based on a planning cost of $5,000 per acre. Natural colonization of plant communities is assumed.

Mechanical Excavation

The major elements of work associated with the mechanical excavation are summarized below.

- Perform mechanical excavation in the south end of the Shell Pond where the surface is dry and where the water thickness is insufficient for hydraulic removal. The area is estimated at approximately 8 acres with removal of approximately 31,000 in-situ cubic yards of impacted material.
- Clear and grub/build access to areas necessary to access the pond for dredging and to remove large boulders or debris from the pond.
- Install and maintain silt fences around the work area and turbidity curtains ahead of all pond offsite discharge points in accordance with Best Management Practices (BMPs) for the duration of the project.
- Construct an engineered HDPE (or similar)-lined dewatering cell with berms in the area to the south and west of the Shell Pond.
- Remove impacted non-native material and debris from the perimeter near shore using a low ground-pressure land-based excavator; stockpile the material and debris on the shelf. Prior to shelf excavation, silt curtains/turbidity barrier will be installed along the edge of the shelf to prevent runoff directly into the adjacent sloughs and Honker Bay.
- Transfer excavated material to nearby pre-treatment stockpile areas.
- The pre-treatment stockpile areas will be constructed to prevent uncontrolled discharge of runoff or supernatant waters from the area.
- Collected runoff waters will be secured and collected for recycling during mixing operations.

- Treatment of raw impacted material will be by means of mixing with an amendment (e.g., cement or similar product) assuming 5-10% by dry weight of the material. Cement additions will be controlled within a defined accuracy. Also the uniformity of mixing will be assessed regularly throughout the project. This mixing may occur in-situ or ex-situ.
- After mixing, the treated material will be allowed to dry to meet moisture content requirements for offsite transport or consolidation area placement. Curing will occur in an adjacent curing or post-treatment stockpile area. These post-treatment storage areas will have a similar construction and surface protection to that proposed for the raw material stockpile areas.
- It is assumed that the treated material will be stored for up to one week allowing the treated materials' mechanical properties to begin to stabilize as the amendment cures. The material may need to be conditioned from time to time by mechanical tilling, in order to accelerate drying and thereby reduce inherent moisture to optimum levels suitable for final placement.
- The treated material will be transported to an approved disposal facility. The transport rate is the determining factor for the length of time required to place treated material.
- Treatability trials testing will be conducted to determine elutriate quality on the effluents generated from the dredging trials. This will determine the combinations of unit processes such as pre-settling, coagulation, flocculation, sedimentation, filtration, and granular activated carbon adsorption produced the required treated water specification.
- Excess water will be treated as necessary prior to return to the slough.
- Backfilling of dredge areas will not be necessary except where levees are removed. The levee material will be graded over the adjacent pond. Any materials used to berm the drying beds will also be graded and left onsite.
- Restore the site to include removal of access material and revegetation of disturbed areas, and demobilize all personnel, equipment, materials, and supplies utilized to complete the work.

Carbon Black Area

- 22 acres of the Carbon Black Area east of the Shell Pond will be covered with approximately 1 foot of soil scraped from the upland area west of the Shell Pond.
- The area will be hydroseeded.

Former Wastewater Discharge Ditch

- The ditch is 1,200 feet long and the total removal volume is estimated to be between 300 to 600 in-situ cubic yards. The cost estimate assumes 450 in-situ cubic yards are removed.

B.3 Cost Summaries – Bid Totals

The following sheets provide the ROM bid totals for each Alternative. The key differences in the bid totals for the sub alternatives are:

Alternative 2 – Total Cover

2a: Assumes 1 foot of vegetative cover
2b: Assumes a 2-foot foundation layer, geogrid, GCL and 1 foot of vegetative cover

Alternative 3 – Consolidation on the Carbon Black Area

3a: Assumes 1 foot of vegetative cover on top of dewatered Geotubes®

3b: Assumes GCL and 1 foot of vegetative cover

3c: Assumes: 80 mil HDPE and drainage layer below the HDPE-lined containment area for the Geotubes®. The cover is GCL, drainage net and 2 feet of vegetative soil.

3d: Assumes cover of GCL, drainage net and 2 feet of vegetative soil.

Alternative 4 – Consolidation at south end of Shell Pond
(12 acres: 8 in south end of pond and 4 upland acres)

Note: Impacted non-native material in the 8 acres is not removed because it is part of the consolidation area.

4a: Assumes cover of 1 foot of vegetative soil on top of dewatered Geotubes®.

4b: Assumes cover of GCL and 1 foot of vegetative soil.

Alternative 5 – Complete Removal

No bid total variations.

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BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 1, Water Cap					
1010	Mobilization & Submittals		1.000	LS	29,862.78	29,862.78
1020	Develop Acess Road		1.000	LS	383,617.43	383,617.43
1030	Pumping Station		1.000	LS	192,889.91	192,889.91
1035	Construction Oversight, Biomonitoring, Closeout		3.000	MO	50,111.40	150,334.20
1130	Demobilization		1.000	LS	8,331.93	8,331.93
		Total Alternative 1, Water Cap				$765,036.25

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 2A, Total Cover					
2010	Mobilization & Submittals		1.000	LS	111,238.74	111,238.74
2020	Develop Access Road		1.000	LS	383,617.43	383,617.43
2025	Treatment Plant		1.000	LS	275,557.01	275,557.01
2100	Furnish & Place Cover Material		222,700.000	CY	38.15	8,496,005.00
2110	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22
2120	Breach Dike		1.000	LS	16,829.89	16,829.89
2125	Construction Oversight, Biomonitoring, Closeout		8.000	MO	50,111.40	400,891.20
2130	Demobilization		1.000	LS	41,659.63	41,659.63
		Total Alternative 2A, Total Cover				$10,128,112.12

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 2B, Total Cover					
2210	Mobilization & Submittals		1.000	LS	111,238.74	111,238.74
2220	Develop Access Road		1.000	LS	383,617.43	383,617.43
2225	Treatment Plant		1.000	LS	275,557.01	275,557.01
2300	Construct 2'Fdn + Geogrid +Claymax + 1' Cover		73.000	AC	253,761.04	18,524,555.92
2310	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22
2320	Breach Dike		1.000	LS	16,829.89	16,829.89
2325	Construction Oversight, Biomonitoring, Closeout		8.000	MO	50,111.40	400,891.20
2330	Demobilization		1.000	LS	41,659.63	41,659.63

Total Alternative 2B, Total Cover $20,156,663.04

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 3A Hyd/Mech Removal to Carbon Black					
3010	Mobilization, Road and Receiving Area		1.000	LS	67,476.03	67,476.03
3012	Develop Access Road		1.000	LS	383,617.43	383,617.43
3014	Prepare Receiving Area/Cell Bottom Layer		1.000	LS	1,803,204.48	1,803,204.48
3016	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
3018	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
3020	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
	Removal By Dredging					
3024	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
3026	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
3028	Dredging to Geotubes in Carbon Black Area		209,000.000	CY	47.85	10,000,650.00
3032	Demobilization, Dredging Operation		1.000	LS	105,307.21	105,307.21
		Total Removal by Dredging				$10,374,833.43
	Removal By Mechanical Method					
3038	Mobilization & Submittals		1.000	LS	112,759.23	112,759.23
3042	Install Mats		1.000	LS	89,280.47	89,280.47
3046	Excavate & Haul to Carbon Black Area		31,000.000	CY	23.59	731,290.00
3050	Demobilization, Mechanical Removal		1.000	LS	124,978.90	124,978.90
		Total Removal by Mechanical Method				$1,058,308.60
3070	Analytical/Characterization		1.000	LS	132,267.36	132,267.36
3100	Construct 1' Cover		22.000	AC	61,604.20	1,355,292.40
3110	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
3120	Breach Dike		1.000	LS	16,829.89	16,829.89
3125	Construction Oversight, Biomonitoring, Closeout		22.000	LS	50,111.40	1,102,450.80
3130	Demobilization		1.000	LS	105,307.21	105,307.21

Total Alternative 3A, Hyd/Mech to Carbon Black $19,151,666.22

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 3B Hyd./Mech Removal to Carbon Black					
3210	Mobilization, Road and Receiving Area		1.000	LS	67,476.03	67,476.03
3212	Develop Access Road		1.000	LS	383,617.43	383,617.43
3214	Prepare Receiving Area/Cell Bottom Layer		1.000	LS	1,803,204.48	1,803,204.48
3216	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
3218	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
3220	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
	Removal By Dredging					
3224	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
3226	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
3228	Dredging to To Geotunbes in Carbon Black Area		209,000.000	CY	47.85	10,000,650.00
3232	Demobilization, Dredging Operation		1.000	LS	105,307.21	105,307.21
		Total Removal by Dredging				$10,374,833.43
	Removal By Mechanical Method					
3238	Mobilization & Submittals		1.000	LS	112,759.23	112,759.23
3242	Install Mats		1.000	LS	89,280.47	89,280.47
3246	Excavate & Haul to Carbon Black Area		31,000.000	CY	23.59	731,290.00
3250	Demobilization, Mechanical Removal		1.000	LS	124,978.90	124,978.90
		Total Removal by Mechanical Method				$1,058,308.60
3270	Analytical/Characterization		1.000	LS	132,267.36	132,267.36
3300	Construct GCL + 1' Cover		22.000	AC	109,555.58	2,410,222.76
3310	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
3320	Breach Dike		1.000	LS	16,829.89	16,829.89
3325	Construction Oversight, Biomonitoring, Closeout		22.000	LS	50,111.40	1,102,450.80
3330	Demobilization		1.000	LS	105,307.21	105,307.21

Total Alternative 3B, Hyd/Mech to Carbon Black $20,206,596.58

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 3C Hyd./Mech to Carbon Black CLII LF					
3410	Mobilization, Road and Receiving Area		1.000	LS	67,476.03	67,476.03
3412	Develop Access Road		1.000	LS	383,617.43	383,617.43
3414	Prepare Receiving Area/Cell Bottom Layer w/Drain		1.000	LS	3,760,761.47	3,760,761.47
3416	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
3418	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
3420	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
	Removal By Dredging					
3424	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
3426	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
3428	Dredging to To Geotunbes in Carbon Black Area		209,000.000	CY	47.85	10,000,650.00
3432	Demobilization, Dredging Operation		1.000	LS	105,307.21	105,307.21
		Total Removal by Dredging				$10,374,833.43
	Removal By Mechanical Method					
3438	Mobilization & Submittals		1.000	LS	112,759.23	112,759.23
3442	Install Mats		1.000	LS	89,280.47	89,280.47
3446	Excavate & Haul to Carbon Black Area		31,000.000	CY	23.59	731,290.00
3450	Demobilization, Mechanical Removal		1.000	LS	124,978.90	124,978.90
		Total Removal by Mechanical Method				$1,058,308.60
3470	Analytical/Characterization		1.000	LS	132,267.36	132,267.36
3500	Construct GCL, Geogrid + 2' Cover		22.000	AC	183,122.94	4,028,704.68
3510	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
3520	Breach Dike		1.000	LS	16,829.89	16,829.89
3525	Construction Oversight, Biomonitoring, Closeout		22.000	LS	50,111.40	1,102,450.80
3530	Demobilization		1.000	LS	105,307.21	105,307.21

Total Alternative 3C, Hyd/Mech to CB CLII LF $23,782,635.49

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 3D (Alt 3C less Leachate Collection)					
3610	Mobilization, Road and Receiving Area		1.000	LS	67,476.03	67,476.03
3612	Develop Access Road		1.000	LS	383,617.43	383,617.43
3614	Prepare Receiving Area/Cell Bottom Layer		1.000	LS	1,803,204.48	1,803,204.48
3616	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
3618	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
3620	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
	Removal By Dredging					
3624	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
3626	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
3628	Dredging to To Geotunbes in Carbon Black Area		209,000.000	CY	47.85	10,000,650.00
3632	Demobilization, Dredging Operation		1.000	LS	105,307.21	105,307.21
		Total Removal by Dredging				$10,374,833.43
	Removal By Mechanical Method					
3638	Mobilization & Submittals		1.000	LS	112,759.23	112,759.23
3642	Install Mats		1.000	LS	89,280.47	89,280.47
3646	Excavate & Haul to Carbon Black Area		31,000.000	CY	23.59	731,290.00
3650	Demobilization, Mechanical Removal		1.000	LS	124,978.90	124,978.90
		Total Removal by Mechanical Method				$1,058,308.60
3670	Analytical/Characterization		1.000	LS	132,267.36	132,267.36
3700	Construct GCL, Geogrid + 2' Cover		22.000	AC	183,122.94	4,028,704.68
3710	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
3720	Breach Dike		1.000	LS	16,829.89	16,829.89
3725	Construction Oversight, Biomonitoring, Closeout		22.000	LS	50,111.40	1,102,450.80
3730	Demobilization		1.000	LS	105,307.21	105,307.21

Total Alt 3D, (Alt 3C Less Leachate Collection) $21,825,078.50

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alt.4A, Hyd. Dredging to South End of Pond					
4010	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
4020	Develop Access Road		1.000	LS	383,617.43	383,617.43
4025	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
4027	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
4050	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
4055	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
4060	Dredging, Discharge to South End, Geotubes etc		209,000.000	CY	47.85	10,000,650.00
4064	Carbon Black Area Grading		22.000	AC	3,662.91	80,584.02
4066	Carbon Black Area 1' Fill Imported From West Area		35,500.000	CY	3.98	141,290.00
4067	Revegetate Carbon Black With Native Grasses		22.000	AC	3,857.80	84,871.60
4070	Analytical/Characterization		1.000	LS	110,222.80	110,222.80
4100	Construct 1' Cover		12.000	AC	61,604.19	739,250.28
4110	Revegetation/Wetlands Creation		65.000	AC	5,511.14	358,224.10
4112	Revegetate With Native Grasses		12.000	AC	3,857.80	46,293.60
4120	Breach Dike		1.000	LS	16,829.89	16,829.89
4125	Construction Oversight, Biomonitoring, Closeout		22.000	MO	50,111.40	1,102,450.80
4130	Demobilization		1.000	LS	105,307.21	105,307.21

Total Alt. 4A, Dredge to South End of Pond $15,788,233.32

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alt.4B Hyd. Dredging to South End of Pond					
4210	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
4220	Develop Access Road		1.000	LS	383,617.43	383,617.43
4225	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
4227	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
4250	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
4255	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
4260	Dredging, Discharge to South End, Geotubes etc		209,000.000	CY	47.85	10,000,650.00
4264	Carbon Black Area Grading		22.000	AC	3,662.91	80,584.02
4266	Carbon Black Area 1' Fill Imported From West Area		35,500.000	CY	3.98	141,290.00
4267	Revegetate Carbon Black With Native Grasses		22.000	AC	3,857.80	84,871.60
4270	Analytical/Characterization		1.000	LS	110,222.80	110,222.80
4300	Construct GCL + 1' Cover		12.000	AC	109,619.06	1,315,428.72
4310	Revegetation/Wetlands Creation		65.000	AC	5,511.14	358,224.10
4312	Revegetate With Native Grasses		12.000	AC	3,857.80	46,293.60
4320	Breach Dike		1.000	LS	16,829.89	16,829.89
4325	Construction Oversight, Biomonitoring, Closeout		22.000	MO	50,111.40	1,102,450.80
4330	Demobilization		1.000	LS	105,307.21	105,307.21

Total Alt.4B, Dredge to South End of Pond $16,364,411.76

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
	Alternative 6, Revised Qty, Combined Dredge/Mech.					
6010	Mobilization, Road and Receiving Area		1.000	LS	67,476.03	67,476.03
6020	Develop Access Road		1.000	LS	383,617.43	383,617.43
6040	Clear Prepare Receiving Area		1.000	LS	634,068.88	634,068.88
6045	Treatment Plant		1.000	LS	2,314,678.87	2,314,678.87
6050	Excavation & Stockpile Former Wastewater Ditch		450.000	CY	33.54	15,093.00
6060	Load/T&D Former Wastewater Ditch Material		675.000	TON	29.62	19,993.50
	Removal By Dredging					
6110	Mobilization & Submittals		1.000	LS	127,383.75	127,383.75
6120	Set Up Dredging Operation		1.000	LS	141,492.47	141,492.47
6130	Dredging to Receiving Area, Geotubes Etc		209,000.000	CY	47.85	10,000,650.00
6140	Load/T&D Offsite Material, Incl 5% Cement		261,250.000	TON	35.54	9,284,825.00
6145	Demobilization, Dredging Operation		1.000	LS	105,307.21	105,307.21
		Total Removal by Dredging				$19,659,658.43
	Removal By Mechanical Method					
6210	Mobilization & Submittals		1.000	LS	112,759.23	112,759.23
6240	Install Mats		1.000	LS	89,280.47	89,280.47
6250	Excavate & Haul to Transfer Area		31,000.000	CY	23.59	731,290.00
6260	Load/T&D Offsite Material, Incl 15% Cement		39,000.000	TON	48.43	1,888,770.00
6265	Demobilization, Mechanical Removal		1.000	LS	124,978.90	124,978.90
		Total Removal by Mechanical Method				$2,947,078.60
6276	Carbon Black Area Grading		22.000	AC	3,662.91	80,584.02

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
6278	Carbon Black Area 1' Fill Imported From West Area		35,500.000	CY	3.98	141,290.00
6280	Revegetate Carbon Black With Native Grasses		22.000	AC	3,857.80	84,871.60
6300	Analytical/Characterization		1.000	LS	132,267.36	132,267.36
6310	Revegetation/Wetlands Creation		73.000	AC	5,511.14	402,313.22
6320	Breach Dike		1.000	LS	16,829.89	16,829.89
6325	Construction Oversight, Biomonitoring, Closeout		24.000	MO	50,111.40	1,202,673.60

Total Alternative 6 Combined Dredging/Mechanical $28,102,494.43

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
			Bid Total	========>		$176,270,927.71

**Notes:
Items in italics are Non-Additive.