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## 1.1 OBJECTIVES

This report has been prepared in response to the Regional Water Quality Control Board (RWQCB) letter dated November 5, 2001 (Appendix A), requesting an Addendum to the Feasibility Study (FS) prepared by URS Corporation (URS) in March 2001 for a portion of Peyton Slough (the “Slough”). The Slough is located adjacent to Rhodia Inc. (Rhodia) in Martinez, California (herein referred to as the “Property”) (Figure 1). This addendum includes the items requested in the November 5, 2001 letter from the RWQCB, including selection of the preferred remedial alternative and the following analyses:

1. Conceptual analysis of the extent (area and depth) of habitat that will be impacted by construction (short-term).
2. Conceptual analysis of the long-term positive and/or negative impacts of the remediation on habitat and wildlife, including McNabney Marsh.
3. Revised cost analysis.

This addendum also provides a conceptual remedial action plan (RAP) for the preferred alternative (Full Re-alignment of Peyton Slough).

## 1.2 SITE BACKGROUND

Rhodia operates a sulfuric acid regeneration facility located at 100 Mococo Road in Martinez, California. The property is comprised of approximately 114 acres immediately east of Interstate 680 on the south shore of the Carquinez Strait, adjacent to the southern end of the Benicia Bridge.

The Property has been in continuous industrial use since the early 1900s, and was originally owned by the Mountain Copper Company. Mountain Copper Company operated a copper ore smelter until 1966. Waste by-products from the smelting operation, including cinders and slag, were disposed in piles on the Property. Stauffer Chemical Company purchased the Property from the Mountain Copper Company in 1968, and constructed a sulfuric acid regeneration and manufacturing facility, which has been in operation since 1970. Rhodia currently owns and operates the sulfuric acid regeneration and manufacturing facility.

As shown on Figure 2, the subject portion of the Slough (the “Site”) is located between Waterfront Road and the Carquinez Strait. The Site is comprised of an approximately 5,500 feet long segment of the north-flowing Slough. The Site has been subdivided into the “north Slough” and the “south Slough,” which are separated by a tide gate located approximately 2,400 feet south of the Carquinez Strait. The Slough, particularly the northern segment, has been the subject of several environmental investigations to evaluate metals concentrations in soil and sediment. Copper and zinc have been identified as the primary chemicals of concern (COCs). Based on the results of previous studies conducted at the Site, the RWQCB Bay Protection Toxic Cleanup Program has identified the Slough as one of the “toxic hot spots” within the San Francisco Bay Area (RWQCB, 1997). Subsequently, the RWQCB has requested under Section 13267 of the California Water Code that Rhodia develop a remedial action plan (RAP) that addresses the COCs within the Slough. A copy of the RWQCB letter is included in Appendix A. A FS (URS 2001) was prepared and submitted to the RWQCB in March 2001. The FS provided a comparison of nine remediation alternatives for the Site. Two of these alternatives were selected for further evaluation.

Since the submittal of the FS Report, Rhodia and URS have met with potential contractors and other regulatory agencies in order to assist in the evaluation of realistic implementation schemes for the preferred alternative. To comply with the requirements of the RWQCB 13267 letter request, dated November 5, 2001, (Appendix A) URS, on behalf of Rhodia, has prepared this addendum to the FS, which includes a comparison of both preferred alternatives, the selection of the preferred alternative, and the Conceptual RAP for the preferred alternative, Full Re-Alignment of the Peyton Slough.

## 1.3 AREA OF CONCERN ADDRESSED BY THE FOCUSED FS/RAP

This focused FS/RAP addresses areas of concern (AOCs), which include areas within, and immediately adjacent to the Slough that have COCs at concentrations that exceed the applicable screening levels (Figure 3). For this project, the National Oceanic Atmospheric Administration (NOAA) Effects Range Median concentrations (ERMs), which represent the concentration at which probable adverse effects occur to marine benthic organisms, were used as screening criteria. The ERMs were used to delineate the AOCs within the Site that will require remedial action (URS, 2000a).

The final AOC delineation will be based on the results of the risk assessment, which is currently in progress. This Focused FS includes a conceptual analysis of the alternatives using the definition of the AOC, as previously presented in the FS (URS 2001), including the dredge spoil piles along the embankments of the existing Slough and the Peyton Slough from Carquinez Strait to Waterfront Road.

## 1.4 REPORT ORGANIZATION

The remainder of the report is organized in the following manner:

Section 2 presents a summary of the Focused Feasibility Study (FS), including the preferred remedial alternatives, evaluation of long-term and short-term impacts, and a cost comparison.

Section 3 presents a conceptual design of the selected alternative.

Section 4 presents the conclusions.

Section 5 provides the limitations.

Section 6 provides the technical and regulatory references.

The FS Report (URS 2001) presented a comprehensive evaluation of remedial action alternatives to address the AOCs identified within the Site. Nine general remedial action alternatives were compiled and screened, and the four viable alternatives were then further evaluated. Those four viable alternatives were evaluated based on the following criteria: 1) human health and environment; 2) remedial action objectives (RAOs); 3) short and long-term effectiveness; 4) treatment reliability; 5) implementability; 6) cost; and 7) regulatory and public acceptability. Each alternative was ranked based upon the above criteria, and the two preferred alternatives were selected.

This focused FS has been prepared in accordance with *the Guidance for Conducting Remedial Investigations and Feasibility Studies Under the Comprehensive Environmental Response Compensation Liability Act* (United States Environmental Protection Agency [USEPA], October 1988), herein referred to as the *Guidance.* As the *Guidance* indicates, the purpose of the FS is not the unobtainable goal of removing all uncertainty, but rather to gather information to support an informed risk management decision on the most appropriate remedial action for the Site. The approach described in the *Guidance* has been tailored to site-specific circumstances and modified to consider the inherently unique aspects of sediment remediation. The FS process consists of three general steps:

1. Identification of the general remedial actions, applicable technology types, and implementation options for the identified AOCs;
2. Initial screening and assembly of the viable remedial action alternatives;
3. Evaluation and selection of the preferred remedial alternative(s).

These three general steps were conducted and presented in the FS (URS 2001) submitted to the RWQCB in March 2001, from which the two preferred alternatives were selected: 1) dredge and cap, and 2) re-alignment of the slough.

In this Focused FS, the second and third steps were repeated for the two preferred alternatives using their specifically developed variations described in sections below:

1) Dredge and cap to a depth of 3.5 feet

2) Dredge and cap to a depth of 6.5 feet

3) Partial Re-alignment of the slough

4) Full re-alignment of the slough.

These alternatives were evaluated for the following criteria as specified by the *Guidance*: (1) protection of human health and environment, (2) compliance with RAOs, (3) short and long-term effectiveness and permanence, (4) reductions in toxicity, mobility, and volume through treatment, (5) implementability; (6) cost; and (7) state and community acceptance. Based upon the ranking of each viable alternative against the applicable criteria, a preferred alternative is identified.

These alternatives are summarized below.

## 2.1 PREFERRED REMEDIAL ALTERNATIVES

### 2.1.1 Alternative 6-Modified, Dredging and Capping of Peyton Slough

This remedial action alternative is comprised of two parts: removal and capping. Removal of sediments containing elevated COCs in the AOCs would be accomplished by dredging or excavation. Removal activities would be targeted at sediments located in areas that are bio-available to the ecological community. Shallow sediments in the Slough (bioactive and bioturbation layers) and the dredge spoil piles containing elevated COCs would be targeted for removal. Once the shallow sediments have been removed, the existing Slough would be capped to isolate deeper sediments containing elevated COCs from the ecological community. Capping is the placement of an engineered cap to isolate deeper sediments containing COCs from aquatic and other habitat and to provide a layer within which natural habitat may be reestablished.

#### *2.1.1.1 Screening of Removal Processes for the AOC.*

In the FS (URS 2001), three primary sediment removal options were evaluated, including: 1) land-based excavation, 2) mechanical dredging, and 3) hydraulic dredging. After further evaluation and discussions with local contractors with experience in marsh excavation activities, land-based excavation emerged as the preferred method for removal of sediments in the marsh and slough.

**Land-based Excavation**. Land-based excavation uses conventional earth-moving equipment to remove the soil. Excavation would require dewatering of the area to be excavated and has a number of advantages over hydraulic and mechanical dredging. It eliminates the problem of sediment resuspension, reduces dewatering of removed sediments, and decreases the volume of water generated. For any of the alternatives, this method would require the placement of temporary roadways in the marsh from which land-based excavation would be conducted.

**Mechanical Dredging**

Mechanical dredging uses mechanical force to dislodge and excavate the sediment. During mechanical dredging, minimal water is entrained in the sediment. Sediment is removed at near in-situ densities. Upon lifting, approximately 30% of the clamshell will be occupied by incidental free water that will need to be decanted and potentially treated prior to disposal.

Mechanical dredging may be applicable to the entire AOC, and could be conducted solely from a barge or as a combination of land-and barge-based operations. Access by land is not likely to be feasible in some areas along the Slough. While barge-based mechanical dredging has been used in Peyton Slough in the past, barge-based operations would be limited to high tide cycles to accommodate the equipment in the existing Slough.

To ensure that sediment re-suspended during barge-based mechanical dredging operations is not transported outside the AOC, a containment barrier may be installed prior to removal activities. The removed sediments would be placed on a second containment barge to separate water and sediments. Sediments would then be placed in a dump truck at a staging area and transported to the centrifuge for further dewatering.

**Hydraulic Dredging**

Hydraulic dredging uses suction force to remove the sediment in a slurry form with a solids content ranging from 5% to 20%. Sediment would be transported to an on-site confined storage facility (CSF) through a pipe for solid-liquid separation and drying. Due to the high water content of the dredged sediment, additional sediment dewatering would be necessary. Sediments in slurry form would be pumped to the staging area and centrifuged to remove excess water, which would then be treated in the onsite treatment plant. Due to the large volume of water generated during the dredging activities, there may not be adequate capacity available by the current water treatment system.

Hydraulic dredging is costly and time-consuming by the generation of large volumes of slurry that require treatment. Mechanical and hydraulic dredging would both be very difficult to implement as work would necessarily be conducted only during high tide cycles.

For any of the Dredge and Cap or the Re-Alignment alternatives, land-based excavation is preferable to either mechanical or hydraulic excavation.

#### *2.1.1.2 Capping in the Existing Slough*

Capping options include soil/sediment (such as, “Bay mud”), GCL (bentonite composite), or a composite cap utilizing a geomembrane liner. Composite caps include concrete, Armorflex, and geosynthetics, possibly in addition to soil layers. Capping performs the primary functions of physical and chemical isolation of the sediment from the benthic environment and erosion prevention. The cap would be designed to meet the joint USEPA and USACE guidance for in-situ subaqueous capping of contaminated sediments (USEPA 1998, 1996). The final selection of cap material will be based on such design criteria, as well as meeting the site-specific RAOs.

The engineered cap will function to contain deeper sediments in the existing Slough, reduce the mobility and the toxicity of the capped sediments, and eliminate exposure through direct contact by human and ecological receptors.

Each type of capping material has certain advantages. A composite cap or low permeability soil or GCL cap will provide isolation of sediments from further re-suspension in the Slough, and therefore, from further contamination of sediments in the Slough. The placement of a concrete cap with a material such as “Armorflex” will provide protection against resuspension of sediments, but will not necessarily provide isolation from dissolved constituents in the underlying COCs in the sediments just below the permeable geotextile fabric under the concrete cap. However, sediments placed above the concrete cap will provide isolation of dissolved phase metals as well as provide a clean substrate for benthic community and higher trophic level organisms.

Preliminary evaluation of the low permeability soil or GCL cap may not provide a long-term solution to potential recontamination in the existing Slough. The low permeability cap may require an excessively thick layer in order to isolate the underlying contaminated sediments. The placement of GCL in the Slough is limited in areas where chloride concentrations are higher (such as from brackish or salt water influx). Therefore, GCL may not be effective in the existing Slough environment.

A low permeability soil cap requiring greater thickness below the bottom of the existing Slough sediments would in turn require shoring of the embankments at an excessive cost to habitat.

### 2.1.2 Alternative 7-Modified, Re-Alignment of Peyton Slough

The purpose of installing a new slough is two-fold. First, this alternative will provide an open channel with potential to create sufficient hydrodynamic properties to maintain habitat within the upstream Shell Marsh (McNabney Marsh). Second, the new slough will provide uncontaminated habitat and allow for closure of the existing Slough in a manner that will reduce the potential for impacts to sensitive receptors. This alternative provides an attractive long-term solution to the global issues at Peyton Slough as well as the Shell Marsh.

This alternative is comprised of two parts: 1) slough re-alignment; and 2) capping and filling. Slough re-alignment involves placement of the slough through an either full or partial new alignment in the adjacent marsh bypassing the most contaminated AOCs. Capping the existing Slough would be conducted using the materials excavated from the new alignment or with imported backfill. A liner or treatment of sediments may be used to isolate underlying sediments containing elevated COC from the ecological community. The material excavated from the new alignment may be used to restore the existing alignment to marsh habitat. The actual cap design will be evaluated and presented in the final design documents. For a partial re-alignment option, the remaining Slough would require dredging and capping to isolate sediments from habitat. For both the partial or full re-alignment options, the tide gate would require relocation to the approximate 1,000 feet-long levee located east of the polishing pond.

The potential new slough alignments are:

1. A partial open, unlined channel installed from the bend in the levee to a small tidal slough located to the east of Peyton Slough at the Carquinez Strait, and
2. A full unlined, open channel located from the railroad crossing at Waterfront Road to a small tidal slough located to the east of Peyton Slough at the Carquinez Strait.

**Partial Re-Alignment.** The partial re-alignment alternative is included to evaluate the short-term impacts compared to the two preferred alternatives (dredge and cap and full re-alignment). The partial re-alignment involves the re-alignment of the south slough from the levee south to Waterfront Road, and the dredging and capping of the north Slough. The levee located approximately 1,000 feet south of the Slough would require breaching and the tide gate would be moved to that location. The area between the existing tide gate and the new tide gate location would be capped and backfilled. The tide gate would require relocation at a substantial cost. The new alignment would require involvement from the private owners to the north and south of the levee (Shore Terminals) and State Lands to secure access. Based on topographic limitations in elevation, the partial alignment would not resolve the future maintenance and dredging issues and may limit long-term effectiveness of habitat improvements in the upstream marsh.

**Full Re-Alignment.** Implementation of this option addresses all AOCs, and does not require the removal of sediments within the existing Slough. The existing Slough alignment would be closed by backfilling and capping to isolate deeper COCs from habitat. The capping of the existing Slough would possibly require importation of clean fill in order to provide enough material to cap and restore the Slough to habitat. The new alignment would require involvement from the private owners to the east of the southern portion of the Slough (Shore Terminals) and State Lands to secure access.

This alternative would require discussions with all applicable regulatory permitting agencies. Endangered species within the existing Slough would need to be temporarily relocated. Mitigation for the habitat lost due to the filling of the existing alignment would be provided by the new slough alignment. Potential for recontamination would be minimized. Because the new alignment provides an uncontaminated substrate, this alternative also minimizes future operations and maintenance costs for the Contra Costa Mosquito and Vector Control District (CCMVCD).

## 2.2 EVALUATION OF SHORT-TERM AND LONG-TERM IMPACTS

The preferred alternatives meet the remedial objectives to varying degrees. They isolate COCs from potentially sensitive receptors, create a slough with the hydrodynamic properties of the existing Slough, and provide for opportunities to improve the surrounding and upstream marsh habitat including McNabney Marsh.

The purpose of this evaluation is to provide an analysis of the extent to which each alternative meets those remedial objectives and provides long-term benefits to the environment. An analysis of short-term and long-term impacts was conducted using conceptual level design of each of the preferred alternatives and their variations.

The results of this conceptual analysis are summarized in Table 1, and demonstrate that the short- and long-term impacts are much greater using the dredge and cap alternative or partial re-alignment than the full re-alignment alternative. The detailed analysis of impacted areas is provided in Appendix B.

The re-alignment alternative provides the most effective method of isolation from potential receptors and minimization of potential migration of contaminants or potential re-contamination in the long-term. The engineered cap in the existing Slough provides a barrier to migration of contaminants while isolating sediments from sensitive receptors. It also creates a new and uncontaminated slough habitat, while replacing wetland habitat in the existing Slough alignment.

The following is an description of each of the alternatives and their benefits and impacts based on conceptual design.

**Dredging and Capping of the Existing Peyton Slough.** A layout of this alternative is shown on Figure 4. The Dredge and Cap alternative involves the excavation of sediments in the existing Slough, and capping the existing Slough using a composite cap. The existing Slough is approximately 5,500 feet long and averages approximately 40 feet wide. Two excavation depths were evaluated in order to demonstrate the short-term and long-term impacts and costs of dredging and capping in the existing Slough:

1) Sediment to a depth of 3.5 feet, or

2) Sediment to a depth of 6.5 feet (estimated average depth of COCs).

***Dredging and Capping to 3.5 Feet.*** Using a required 4:1 slope cut back in the slough excavation, a 44-foot wide band of wetlands on each side of the slough would be removed and partially restored upon capping and revegetation of temporary access roads. The total area dredged would require the removal of approximately 74,400 cubic yards of sediments from an area of approximately 10.8 acres. The cap will require the replacement of 50,100 cubic yards of material within the excavated slough covering an area of 7.8 acres. The existing slough would be increased to approximately 56 feet wide on average (up from a 40-foot wide slough on average), causing the permanent removal of a 14-foot wide band along the east and west sides of the Slough and temporary damage to the 30-foot wide band where the access roads would be installed. The total impacted habitat surface area is approximately 16.6 acres.

***Dredging and Capping to 6.5 Feet.*** Due to the depth of the excavation in this variation of the dredge and cap alternative, shoring of the entire length of the existing Slough would likely be required. Therefore, the slope cut back in the Slough excavation would be 2:1. A 43-foot wide band of wetlands on each side of the slough would be removed and partially restored upon capping and revegetation of temporary access roads. The total area dredged would require the removal of approximately 80,800 cubic yards of sediments from an area of approximately 14 acres. The cap will require the replacement of 74,000 cubic yards of material within the excavated slough with a remaining surface area of 8.0 acres. The existing slough would be increased to approximately 42 feet wide on average (up from a 40-foot wide slough on average), causing the permanently removal of a 12-foot wide band along the east and west sides of the Slough and temporary damage to the 30-foot wide band where the access roads would be installed. The total impacted habitat surface area for this alternative is the largest of the variations at approximately 19.7 acres.

Access roads for the implementation of either of the dredge and cap alternatives would be constructed along the embankments of the existing Slough and then removed after capping in order to restore temporarily disturbed habitat. The transition of the operation of the existing Slough after capping may require the operation of a pipe bypass for discharge of surface water from the upland areas, potentially in conjunction with the installation of silt curtains in the Slough.

While conceptual analysis indicates very similar removal and wetland habitat losses, the cost of implementation this variation of the dredge and cap alternative is extremely high. (See Section 2.3.)

**Partial Re-Alignment Alternative.** As shown on Figure 5, the partial re-alignment alternative involves the excavation of sediments in the north section of the existing Slough to an average depth of 3.5 feet deep, and capping of the northern section of the existing Slough using a composite cap in a portion of the Slough. The south section of the existing Slough would be capped, and re-located to the east of the existing Slough. Excavation and widening of the existing tributary channel (located to the east of the polishing pond) serves to connect the partial new alignment (southern section) to the dredged and capped northern section. This partial alignment was prepared to demonstrate a variation on re-alignment and was suggested in the original FS, A modified conceptual design of the partial re-alignment was suggested by the Bay Conservation and Development Commission (BCDC) and is the basis for this focused FS evaluation.

The total volume of material removed from the dredging of the northern section and the new alignment in the southern section plus material removed for widening is estimated at 36,000 cubic yards over an area of approximately 5.9 acres. This alternative requires the relocation of the tide gate, which requires the removal of approximately 1,000 cubic yards of soil over approximately 0.1 acres for the installation of the foundation of the tide gate. The capping of the excavated Slough will require the placement of an engineered cap in the northern section, as well as in the southern section. The northern section cap (17,500 cubic yards over 3.3 acres) will be used to continue operating that section of the existing Slough, and the southern section cap (17,800 cubic yards over 4.6 acres) will be used to close that section of the Slough. The total impacted habitat surface area is approximately 17.2 acres of which 1.2 acres is converted permanently to levee fill.

Access roads will be constructed directly upon the new alignment in the southern section, and then removed during the excavation of the new slough. The transition of the operation of the existing Slough to the partially aligned slough may require the operation of a pump bypass for discharge of surface water from the upland areas.

**Full Re-Alignment Alternative.** As shown on Figure 6, the full re-alignment alternative involves the excavation of sediments in the new alignment area to form the new slough (approximate depth of 4 feet and a nominal top width of 30 feet). This conceptual design of the new alignment provides for the hydraulic capacity currently provided by the existing Slough at the culvert under the railroad tracks. However, because the new alignment is located in an uncontaminated area, the new slough may be widened and deepened, as necessary for maintenance or enhancement dredging, by the CCMVCD.

The total volume of material to be removed from the new alignment is 17,700 cubic yards over an area of approximately 3.1 acres along 4,500 feet plus 300 feet of existing slough that will be widened at the mouth. This alternative requires the relocation of the tide gate, which requires the removal of approximately 1,000 cubic yards of sediment over approximately 0.1 acres for the installation of the foundation of the tide gate. The capping of the existing Peyton Slough will require the placement of an engineered cap (possibly consisting of some material excavated from the new alignment) in order to convert the existing Peyton Slough alignment into habitat. The cap elevation will determine the type of habitat created on the existing Slough. Approximately 31,500 cubic yards of material, over approximately 7.3 acres will be required to cap the Peyton Slough.

Temporary access roads and trestles will be constructed on the new alignment and removed during excavation of the new slough. The transition of the operation of the existing Slough to the re-alignment would require the operation of a pipe bypass for discharge of surface water from upland areas.

A comparison of habitat impacts is shown in Table 1, and indicates that the re-alignment alternative minimizes temporary habitat disturbance compared to the other dredge and cap or partial re-alignment alternatives. The total impacted habitat surface area is approximately 15.6 acres of which 1.2 acres is converted permanently to levee fill.

Present concentrations of metals and low pH that exist at the site have been determined to impose a potential risk to human ecological receptors that may inhabit the area (URS 2000), therefore, the project is “necessary to the health, safety, or welfare of the public” in the Bay area. If a remedial action to remove and contain sediments in the AOC is not pursued, contaminated sediments will continue to have the potential to migrate into the Bay. The full re-alignment alternative provides the least likely scenario to become recontaminated over the long-term due to sediments containing COCs exceeding the RAOs by isolating them from the new slough habitat.

Also, present conditions at the site are not suitable for a healthy, viable benthic community or, indirectly, for higher trophic level species. The ultimate objective of the proposed remediation project is to restore sediment quality and, in turn, create a safe and suitable environment for humans and wildlife. This alternative creates an uncontaminated slough substrate with no future potential breach into underlying sediments caused by erosion, over dredging, or other conditions that would be present under the other alternatives. The capping of the existing Slough and the relocation of the slough in its new location will provide a barrier to potential migration of COCs to the new alignment. Thus, the long-term benefits from the fill (engineered cap in the existing Slough) will be such that it will “minimize harmful effects to the bay area, such as, the reduction or impairment of the volume of surface area or circulation of water, water quality, fertility of marshes or fish or wildlife resources, or other conditions impacting the environment...” (McAteer-Petris Act, Section 66605[d]).

**Summary of Impacts.** The following summary describes the evaluation of short-term and long-term impacts to habitat for the preferred alternative.

The re-alignment alternative is preferable to the dredge and cap alternatives or the partial re-alignment because it provides a slough that can be easily enlarged without the potential for disturbing contaminated areas, and which minimizes long-term re-contamination and migration issues. Furthermore, the dredge and cap and partial re-alignment alternatives require a cap in the functioning slough, which can be disturbed by future maintenance or enhancement dredging.

Temporary and permanent habitat damage calculations indicate that the implementation of the re-alignment alternative is least disruptive to habitat and the manner in which it will be implemented minimizes potential exposure to contaminated sediments. The dredge and cap alternatives require greater habitat impacts during construction due to the required depth and width of excavation in the existing Slough, and would also require disturbance of large volumes of contaminated sediments.

By preventing further disturbance of contaminated sediments and by permanently and completely isolating those sediments from the habitat via capping the existing Slough, the re-alignment alternative is the most effective long-term remedial action for the Peyton Slough. A barrier to recontamination will be created because the new alignment is located in uncontaminated soil and is a distance from the sediments containing COCs, which minimizes the potential for future recontamination. Whereas, the placement of an engineered cap in the dredge and cap or partial re-alignment options may recontaminate due its close proximity to the underlying COCs, which if breached by necessary future dredging activities would continue to impact the surrounding existing Slough and upstream McNabney Marsh habitats.

During the implementation of the full re-alignment alternative, additional marsh habitat will be created in the location of the existing Slough and a slough habitat and waterway will be created in the new alignment. In addition, the full re-alignment provides the most advantageous mechanism for enhancement of the McNabney Marsh including creation of the following features: (1) restore flow of salt water to the upstream marsh lands and subsequent restoration of salt marsh habitat; (2) ease of future enlargement of either the tide gate or the re-aligned slough; and (3) ease of future maintenance dredging to any depth desired by the CCMVCD. The new slough alignment provides unrestricted future maintenance and/or habitat enhancement dredging without the potential for resuspension and exposure of contaminated sediments that could occur during dredging in the existing Slough.

Upon completion of the slough remediation, the McNabney Marsh will convert from a fresh water lagoon to a salt water habitat by muted tidal action. This conversion will provide the following benefits:

- An increase in the use of the area by shorebirds that migrate on the Pacific flyway for foraging and roosting;
- Encouragement of plants that will provide better foul food, making it a more hospitable environment for foul; and
- Enhancement of fishery and a promotion of a more diverse and abundant community.

## 2.3 COST COMPARISON

The summary of costs for the two preferred alternatives is presented in Table 2. The cost estimates were developed using conceptual design of each of the two alternatives and the variations. The assumptions for each alternative are provided in the cost details in Appendix C. It should be noted that the cost evaluation uses order-of-magnitude estimates of capital and operations and maintenance (O&M) costs based on conceptual design, rather than detailed, engineering costs estimates. The costs are considered ballpark since they are for comparison purposes only, and will be modified based on final design of the preferred alternative.

The re-alignment alternative emerges as the most cost-effective remedial alternative compared to the dredge and cap or partial re-alignment alternatives. In general, costs decrease based on decreased materials handling, which is consistent with minimizing impacts to habitat.

## 2.4 SELECTION OF PREFERRED ALTERNATIVE

The comparison of the alternatives (Table 3) provides the basis for selection of Alternative 7b-Modified, Full Re-Alignment of Peyton Slough as the preferred alternative. Each of the seven evaluation criteria (described in section 2) were ranked one through five, with five being the highest or most favorable. The sum of the ranking of each criteria for each alternative provides the total ranking for each alternative.

As shown in Table 3, the full re-alignment alternative best meets the criteria, and is the least disruptive alternative to the surrounding habitat. While all of the alternatives meet the remedial objectives to varying degrees, the full re-alignment alternative provides for the solution that best meets the RAOs, and provides additional positive impacts and opportunities for future benefits, and is the most cost-effective solution. The full re-alignment alternative minimizes the potential for ongoing risk to sensitive receptors by allowing future maintenance or habitat enhancement dredging without the potential for resuspension and exposure of contaminated sediments that could occur during dredging in the existing Slough under any of the remaining alternatives (dredge and cap or partial re-alignment).

By preventing further disturbance of contaminated sediments and by permanently and completely isolating those sediments from the habitat via capping the existing Slough, the re-alignment alternative is the most effective long-term remedial action for the Peyton Slough. A barrier to recontamination will be created because the new alignment is located in uncontaminated soil and is a distance from the sediments containing COCs, which minimizes the potential for future recontamination.

During the implementation of the full re-alignment alternative, additional marsh habitat will be created in the location of the existing Slough and a slough habitat and waterway will be created in the new alignment. In addition, the full re-alignment provides the most advantageous mechanism for enhancement of the McNabney Marsh including creation of the following features: (1) restore flow of salt water to the upstream marsh lands and subsequent restoration of salt marsh habitat; (2) ease of future enlargement of either the tide gate or the re-aligned slough; and (3) ease of future maintenance dredging to any depth desired by the CCMVCD.

Also, present conditions at the site are not suitable for a healthy, viable benthic community or, indirectly, for higher trophic level species. The ultimate objective of the proposed remediation project is to restore sediment quality and, in turn, create a safe and suitable environment for humans and wildlife. This alternative creates an uncontaminated slough substrate with no future potential breach into underlying sediments caused by erosion, over dredging, or other conditions that would be present under the other alternatives. The capping of the existing Slough and the relocation of the slough in its new location will provide a barrier to potential migration of COCs to the new alignment. Thus, the long-term benefits from the fill (engineered cap in the existing Slough) will be such that it will “minimize harmful effects to the bay area, such as, the reduction or impairment of the volume of surface area or circulation of water, water quality, fertility of marshes or fish or wildlife resources, or other conditions impacting the environment...” (McAteer-Petris Act, Section 66605[d]).

Based on this focused FS and a comparative analysis of the remedial alternatives, the preferred remedial action for the AOC is the full re-alignment of Peyton Slough to a location east of the existing Slough and capping of the existing Slough. This alternative involves land-based and barge-based excavation, capping, coffer dam, dewatering, landfill disposal, and institutional controls. It should be noted that this is a conceptual design and the final remedial design details will be based upon the collection and analysis of data, completion of the bench scale tests, and contractor selection and input. A copy of the final design report will be provided to the San Francisco Regional Water Quality Control Board (RWQCB) on March 15, 2002 in accordance with the Final Order No. 01-094, dated August 20, 2001.

The following section (Section 3.1) includes a conceptual description of each of the elements of the conceptual design for the remedial action identified above. Section 3.2 presents the bench scale tests that will be conducted during the remedial design phase. Section 3.3 describes the institutional controls that will be implemented in conjunction with and upon completion of the proposed remedial activities.

## 3.1 CONCEPTUAL REMEDIAL ACTION PLAN ELEMENTS

The conceptual RAP consists of the following six major elements:

- Site preparation and tide gate installation
- Excavation in the new alignment
- Transition from existing Slough to new alignment
- Dewatering
- Capping the existing Slough
- Verification monitoring

These elements are described in more detail in the following sections.

### 3.1.1 Site Preparation and Tide Gate Installation

Prior to beginning the construction of the remedial alternative, the following site preparation activities will be conducted:

- Site clearing
- Installation of temporary trestle bridges
- Tide gate installation
- Placement of access roads and removal of dredge spoil piles

#### *3.1.1.1 Site Clearing*

The proposed layout of the remedial action work areas is shown in Figure 2. An approximate 1-acre staging area and drying pad will be constructed on the upland area within the Rhodia property to the west of the existing Slough, and will be used for equipment staging, access, staging of excavated sediments, and decanting and containment of free water from sediments/soil.

### 3.1.1.2 Installation of Trestle Bridges

For the implementation of the full re-alignment alternative, three temporary trestle-supported bridges are likely to be required in order to traverse the Slough. The three trestle bridges are estimated to cover approximately 0.34 acres (15,000 square feet). In addition, a fourth trestle-supported roadway may be required in the southern-most section of the new alignment and Slough to facilitate access and equipment movement.  The fourth temporary bridge, if deemed necessary, will be approximately 1,000 feet long and approximately 30 feet wide (0.57 acres or 25,000 square feet), and will be located south of the existing tide gate in the Slough.

### 3.1.1.3 Tide Gate Installation

The levee will be reinforced and widened to the south to support the installation of the tide gate along the slough re-alignment.  The new foundation for the tide gate will be completed (estimated at approximately 1,000 cubic yards [cy] of soil removed over a 0.1 acre area) and the tide gate will be moved during the re-alignment for the eventual opening of the new slough. At the time of transition from the existing Slough to new slough the tide gates will be removed from their existing structure and placed into the new tide gate structure along the new alignment.

### 3.1.1.4 Access Road Placement and Removal of Dredge Spoil Piles

As shown on Figure 6, 30-foot wide temporary access roads will be constructed along the east and west side of the existing Slough for equipment access. The conceptual road design consists of a two to 4 foot layer of clean fill over geotextile fabric.  The roads will be used to support heavy equipment in the marsh during construction of the new slough, and will have turnouts for trucks every 500 feet.

The roads will be constructed by first removing and stockpiling the dredge spoil piles.  As the dredge spoil piles are removed, the access roads will be simultaneously placed. Dredge spoil piles on the east and west sides of the Slough will be scraped and placed in the staging area simultaneous with temporary road construction. The dredge spoil piles may be placed in the Slough prior to capping. A total of approximately 7,000 cubic yards (in-situ) of material from the dredge spoil piles will be removed.

In the area between the existing Slough and the proposed re-alignment, to the south of the levee, dredge spoil piles have spread due to erosion. That area will be included in the AOC to the extent delineated by the risk assessment currently in progress. For the purposes of cost evaluation an area of 4.2 acres is estimated. It should be noted that this area would be temporarily disturbed for any of the alternatives equally, and therefore is not included in the impact analysis. Upon completion of the risk assessment, the estimated surface area will be included as AOC.

### 3.1.2 Excavation in the New Alignment

The new alignment will be excavated with conventional land-based, long reach excavators working from the temporary roadways and bridges. A 30-foot wide access road will be constructed directly in the new alignment to the north approximately 300 feet south of the Carquinez Strait and south to Waterfront Road. A trestle road along the southernmost 1,000 feet may be required due to low-lying land and inundated conditions.

Once the temporary access roads are placed, the new alignment will be excavated, but without opening up the new alignment to either the Carquinez Strait or the culvert at the southern end of the AOC. Excavators will first remove of the temporary roadway materials, then soil from the new alignment, separately. Materials will be placed into haul units for transport to the staging area, where road base and geofabric will be stockpiled and free water will be decanted from soil.

Soil will be excavated from the new alignment to a depth of approximately 4 feet below grade. The in-situ volume to be removed in the new alignment is approximately 17,700 cubic yards. It is anticipated that approximately 1,000 cubic yards of material per crew will be removed and processed each day. Material will be hauled to the staging area for stockpiling prior to backfilling into the existing Slough.

The northernmost 300 feet (in the mouth) of the new re-alignment will be excavated using a mini-barge and excavator, or a floating excavator. The conceptual design includes the tie in of the new alignment to an existing tributary slough located to the east of the Peyton Slough. Barge-based mechanical dredging, at the mouth of the new alignment, will be conducted from the Carquinez Strait. Sediments in the mouth (within the existing tributary slough) will be removed with a clamshell mounted on the working barge and loaded onto a transport barge. The barge will move through the Carquinez Strait to the existing Slough to unload sediments onto a truck located on the access road west of the existing slough. This truck will be equipped with a hopper, or other containment structure to contain the sediments. The incidental free water acquired during each loading cycle will be continuously decanted on the barge. Once the sediment is loaded on the truck, it will be moved to the staging area for unloading. The sediments will be transferred to the drying area where any remaining free water will be decanted, as described in Section 3.1.4.

The total in-situ volume, including dredge spoil piles, estimated for removal is approximately 37,500 cubic yards. Depending on the administrative requirements and material characteristics, sediments and soil may be used as capping material for the existing Slough, or as fill in upland areas of the Rhodia property. Excess soil may be disposed of at an offsite landfill.

Prior to initiation of the sediment removal activities, a pre-excavation/dredging survey will be executed to establish the original elevations and contours of the area to be excavated. The removal of soil from the new alignment will be confirmed by a post-dredge survey as described in Section 3.1.6.1.

### 3.1.3 Transition from Existing Slough to New Alignment

Prior to the final excavation of the full re-alignment, a coffer dam will be installed near the existing Slough downstream of the new alignment tie-in. Additional coffer dams at tributaries to the existing Slough will be required to limit surface water flows into the existing Slough. During construction of the coffer dams, a pipe bypass will be installed to allow temporary flow of upstream surface water (approximately 700 gallons per minute) to the Carquinez Strait via the existing Slough. The coffer dam construction areas will be isolated and seined for fish prior to commencing construction.

Once the coffer dams are completed, the mouth is opened in the new alignment, and the tide gate is installed, then the tie-in to the new alignment will be opened and the flow will be redirected into the new alignment. The temporary bypass will then be shut down.

Once the new slough is functional, the existing Slough will be closed by installation of either a coffer dam or a silt curtain with a weir at the mouth of the existing Slough. The fish will be seined from the existing Slough. Due to the expected difficulty in seining the existing Slough excess water may be removed from the existing Slough, and section nets may be used to localize seining. Fish species will be evaluated upon catching and will be moved to habitat, appropriate to their species and size, prior to commencing the capping of the existing Slough.

The coffer dam will remain in place during the capping of the existing Slough. The free water remaining in the existing Slough prior to capping will be removed and seeps will be identified and controlled using additional coffer dams, as necessary.

### 3.1.4 Dewatering

In the staging area, the sediments dredged from the mouth of the new alignment and the soil excavated from the new alignment will be placed in staging cells where remaining free water will be continuously collected and transferred storage or settling tanks on the site. The storage tanks will be secondary contained with berms to control spillage in an event of an upset. Decanted water will be tested for COCs, and characterized for appropriate disposal and/or reuse on the Site.

### 3.1.5 Capping the Existing Slough

The existing Slough will be capped to provide physical and chemical isolation of the deeper sediments containing copper and zinc from the aquatic and marsh environment. The cap will be placed using land-based excavators working from the temporary access roads built over the former location of the dredge spoil piles along the east and west sides of the existing Slough. Once the cap and restoration of the existing alignment to marsh land has been achieved and verified through post-construction surveys, temporary staging areas, and access roads will be removed and disposed of. The embankments and temporary impacted areas (staging areas, access road, and dredge spoil pile areas) will be regraded and revegetated to allow for long-term restoration in those areas surrounding the re-alignment and the existing Slough alignment.

The key factors in the final design of the cap will be physical and chemical isolation of contaminants, as well as to restore the existing Slough to marsh habitat. The design of the cap will be finalized upon completion of the tests described in Section 3.3.

Physical and chemical isolation will be achieved by designing a component, or “layered” system to meet each objective independent of the other objectives. The additive approach is conservative in that there will be redundancy in the design since a given “layer” may perform multiple functions. However, the additive approach is recommended (USEPA, 1998), and will be used for this cap design.

A "layer" may be a separate physical layer such as a layer of geotextile or an armor layer but is more often a designation of a certain thickness of the cap design. For example, a cap may be designed to be entirely sandy mud with the bottom ¼ designated as the thickness to control chemical flux, the middle ½ for physical isolation, and the upper ¼ to accommodate erosion. In practice, the benthic organisms for which physical isolation is being provided will inhabit the surface layer of the cap. Therefore, the upper ¾ of the cap will provide combined functions of physical isolation and erosion prevention.

The physical isolation component will serve to separate deeper sediments from burrowing benthic organisms. A layer of material greater in thickness than the bioturbation depth of benthic organisms will provide the isolation. As part of the physical isolation design, the consolidation of both underlying sediments and cap material will be predicted. In the higher energy intertidal zone where stabilization of sediments against erosion is the primary concern, the physical isolation will be provided by armor material (coarse granular material and/or geotextile) rather than a bioturbation layer.

The chemical isolation component will be designed to control the short-term advective and long-term diffusive flux of the copper and zinc from the sediments underlying the cap. Migration of metals into the cap by advection may occur if consolidation of the sediments causes movement of pore water into the cap. The cap will be designed to retain any pore water that may migrate due to consolidation. The cap will also be designed to minimize long-term flux of contaminants caused by molecular diffusion. Bench scale testing will be performed to evaluate sediment treatability and geotechnical issues for the cap, and are discussed in Section 3.2.

### 3.1.6 Verification Monitoring

Two monitoring programs will be implemented as part of the capping project. Short-term construction monitoring will ensure the cap is constructed as designed. Long-term monitoring will evaluate the performance of the cap's functional objectives of physical isolation of human and ecological receptors, and chemical isolation of the underlying sediments and associated pore water and groundwater. The final monitoring plan will be determined during the design phase.

#### *3.1.6.1 Short-term Construction Monitoring*

The short-term monitoring program will be used to demonstrate that the engineered cap in the existing Slough and new alignment have been constructed in accordance with the final remedial construction design. Short-term monitoring will include physical and chemical analysis for suitability of the materials used in the cap and ground surveys in the new alignment.

Samples of the cap material (i.e., geotextiles, sand, and bay muds) will be collected during construction. The materials will be tested for grain size distribution, total organic carbon content, strength (geotextile), and chemical parameters in accordance with RWQCB requirements.

A pre-excavation/dredging ground and bathymetric surveys will serve as the baseline description of the bottom profile of the existing Slough at the start of cap construction. A post-excavation/dredging survey will confirm the new slough configuration. Ground and bathymetric surveys will be used during construction to confirm placed material thickness. Upon cap placement, a completion survey will be conducted to confirm cap thickness and material distribution to show that sediments have been capped.

#### 3.1.6.2 Long-term Monitoring

A phased verification monitoring program consisting of periodic visual field surveys will be implemented upon completion of the cap and construction monitoring. The phased approach sets performance thresholds and identifies appropriate monitoring actions based on the results of previous monitoring events.

The field survey program will use visual surveys to monitor the cap conditions and consolidation, to demonstrate the effectiveness of the cap in preventing erosion and isolating the deeper sediments. These surveys will be conducted in conjunction with wetlands restoration surveys and will be conducted by qualified engineers and wetlands biologists. Field survey maps will be generated to indicate changes in conditions from the final construction ground and bathymetric surveys to qualitatively evaluate erosion and changes in the cap surface conditions. If during the first year of semi-annual monitoring the cap meets performance objectives with no erosion and acceptable consolidation, the monitoring may be reduced to annual field surveys for an additional year or two.

In addition, during the remedial design task currently underway, a plan for evaluating results from self-monitoring compliance with established risk-based water quality protection limits will be prepared. The long-term monitoring plan will include the following.

- A summary of the water quality protection standards (WQPS) developed from site-specific risk-based modeling and the role of the WQPS in the self-monitoring program.
- An explanation of the role of each monitoring well in the self-monitoring program (i.e., juxtaposition of potential sources, guard wells, point-of-compliance wells, and receiving water bodies).
- A schedule for groundwater sampling at each well and for reporting of the self-monitoring results to the RWQCB.
- A decision tree for evaluating monitoring the self-monitoring results and describing compliance status.
- Specifications for the content and format of each self-monitoring report.

The results of the periodic monitoring will be presented to and discussed with the RWQCB to evaluate the necessity and/or scope of any additional monitoring activities.

## 3.2 BENCH SCALE TESTS

A program of data collection, testing and analysis will be undertaken to collect and analyze the data needed to design for the consolidation of the underlying sediment substrate as well as the cap materials, erosion, and chemical isolation. Specifically, geotechnical data collection with consolidation testing, chemical flux modeling, and treatability studies will be performed. Each component of the capping process is discussed below.

### 3.2.1.1 Geotechnical Data Collection

Previous investigations in the levee and marsh, plus observations of sediment consolidation, have shown the sediments to be very soft bay mud deposits overlying some peat layers and sand stringers in rare locations. Based on hand augers and geoprobe boreholes in soil in the AOC, bay mud deposits reached 40 feet below grade and up to 70 feet below grade in one location. Field shear vane and laboratory shear vane tests of the upper mud yielded strengths from 7 to 72 pounds per square foot (psf) with an average of 35 psf. Due to the extremely soft nature of bottom sediments, it will be necessary to collect additional geotechnical data on the strength, and physical characteristics of the deeper sediments.

The field exploration program will include in-situ testing and collection of undisturbed samples of recent bay mud deposits. The soil samples of bay mud will be testing in a geotechnical laboratory for undrained shear strength. At a minimum of three locations the shear vane tests will extend to the bottom of bay mud or a maximum depth of 50 feet with measurements taken at an average interval of 3 feet. As higher resolution data is needed to calculate slope stability, the measurement will be increased from a minimum of 2 feet near the surface to 5 feet near the bottom. Undisturbed samples collected with a piston tube sampler will be tested in the laboratory to measure index properties, undrained strength, and consolidation characteristics.

### 3.2.1.2 Consolidation Testing

American Society for Testing and Materials tests with small initial loads and small load increments will be used to measure consolidation characteristic of remolded bay mud under low confining pressures. The geotechnical tests discussed above will be used to provide the data needed to predict the behavior of the underlying sediments. Because a layer of surface material is being removed and replaced with a cap, which will probably have a greater unit weight than the material removed, consolidation of underlying sediments will occur and an additional thickness of capping materials will be needed to compensate for the reduction in thickness and to return the bottom contours to their original configuration.

### 3.2.1.3 Chemical Isolation Modeling

The chemical flux through the cap will be modeled using computer programs developed by the EPA and/or USACE. Advection of pore water into the cap due to consolidation and molecular diffusion will be considered. In addition, the cap design will include features to minimize groundwater migration from the eastern portion of the Site toward the existing Slough. Such features may include cut-off walls to minimize groundwater flow in higher permeability zones (old slough channels and oxbows), permanent subsurface structures to minimize erosion and improve stability near the mouth of the Carquinez Strait, surface treatment to minimize surface water infiltration, and proper grading and drainage to promote wetlands development.

EPA has developed a long-term chemical transport model (the Recovery Model) to predict chemical flux from deeper sediments into or through a cap. This analytical model considers both diffusive and advective fluxes, the thickness of sediment layers, physical properties of the sediments, concentrations of metals in the sediments and groundwater from the eastern portion of the Site, and other parameters. This model will be used to evaluate the effectiveness of chemical containment of the cap, and to estimate the chemical isolation component design for the cap.

#### *3.2.1.4 Treatability Studies*

The cap modeling described in Section 3.2.1.3 will be used to determine whether treatment of the sediments and/or the dredge spoil piles will be necessary prior to capping. If treatment is deemed necessary, a treatability study will be conducted in the design phase to evaluate the effectiveness of various solidification/stabilization reagents and the optimal doses. Solidification/stabilization treatment involves the addition of a reagent that alters the physical and/or chemical characteristics of the sediment to reduce the potential for COCs to leach from the sediment. Stabilization alters the physical properties of the sediment to form a solid material that encapsulates the solids. Solidification may also reduce COC loss by binding the free water in the sediment into a hydrated soil.

## 3.3 POST REMEDIAL INSTITUTIONAL CONTROLS

In response to the RWQCB's request to identify possible control methods that will protect the natural and artificial sediment caps subsequent to the remediation, the property owner has agreed to implement institutional controls as a measure to minimize cap disturbance. A Covenant and Environmental Restriction will be recorded in the official records of Contra Costa County by Rhodia and potential the California State Lands Commission containing limitations that serve to regulate the use of the AOC that is capped. The Covenant and Environmental Restriction will be incorporated into each deed of any portion of the offshore project area and may impose a variety of limitations and conditions.

The management plan for maintaining post-remedial controls will address the RWQCB requirement to have an enforceable mechanism in place to demonstrate the ongoing compliance with site mitigation conditions. It will provide a list of maintenance procedures and a maintenance schedule that should establish ongoing prevention of the recontamination of the re-aligned slough. Limitations to protect the caps will include restrictions on drilling and excavation operations.

An FS has been developed for the AOCs identified in the Pre-Dredging Investigation (URS 2000). This report was submitted to the RWQCB on December 28, 2000 for RWQCB review. Nine remedial action alternatives were initially screened based on regulatory and technical implementability. The initial screening produced four viable remedial action alternatives which were further evaluated based on seven criteria: protection of human health and environment; compliance with RAOs; short and long-term effectiveness and performance; reductions in toxicity, mobility, and volume through treatment; implementability; cost; and regulatory and community acceptance. Based on this analysis, Alternative 6a (Mechanical Dredging to a Depth of 3 Feet with Silt Screen, Landfill Disposal, Capping, and Institutional Controls) and Alternative 7b (Full Re-alignment of the Peyton Slough, Capping and Backfilling of the Existing Slough Alignment, Restoration of Marsh and Institutional Controls) emerged as the preferred alternatives. Typically one alternative is identified as a preferred alternative. However, two preferred alternatives were identified because there remained some unresolved environmental permitting issues and technical questions with both alternatives that precluded a final decision. A final preferred alternative was selected as part of this addendum to the FS and described in the conceptual remedial action plan.

The preferred alternative involves the construction of a new slough alignment from the Waterfront Road railroad culvert to the Carquinez Strait. The full re-alignment would be located to the east of the current alignment (Figure 6). The existing Slough would be de-watered, an engineered cap placed on top of the contaminated sediments, and backfilled with the soil excavated from the new slough alignment or clean imported material. All wetland vegetation would be restored.

While all of the alternatives meet the RAOs, the full re-alignment alternative provides for additional positive impacts and opportunities for future benefits, and is the most cost-effective solution. The full re-alignment alternative minimizes the potential for long-term, ongoing risk to sensitive receptors by (1) allowing future maintenance or habitat enhancement dredging without the potential for resuspension and exposure of contaminated sediments, and (2) minimizing the potential migration of contaminants to the new alignment.

The Addendum to the FS and Conceptual RAP has been prepared in accordance with the scope of services mutually agreed upon between Rhodia and URS, and within the standard of care for the practice in Northern California at the time this service was provided. Information obtained from interviews or provided to URS by third parties has been assumed to be correct and complete. We do not assume any liability for misrepresentation of information or for items not visible, accessible, or present on the Site.

The report presents a conceptual design of the selected remedial alternative and includes recommendations for determining the final design. The final design may vary from the conceptual design based on the findings of the bench scale tests, the ongoing risk assessment, field conditions, and selected contractor requirements.

The cost estimates included in this report are based on the conceptual design and are therefore considered preliminary. These costs will vary depending upon completion of the final remedial design and contractor selection and input.

The conceptual design was based upon investigations and data gathered as part of the remedial activities for the Site. No investigation is thorough enough to preclude the presence of materials on the subject property that presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable may, in the future, become subject to different regulatory standards and require remediation.

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