Section 13. Detailed Analysis of Remedial Alternatives

Section 300.430(e) of the NCP and the guidance for conducting RI/FS activities under CERCLA (EPA, 1988a) requires a remedial alternative evaluation based on nine criteria. This section evaluates each alternative described in Section 11 against the nine criteria, which are:

1. Overall Protection of Human Health and the Environment. This criterion provides an overall assessment of whether the alternative provides adequate protection of human health and the environment. The overall protection assessment draws upon other evaluation criteria, especially compliance with ARARs, long-term effectiveness and permanence, and short-term effectiveness. The protectiveness evaluation focuses on how site risks would be reduced or eliminated by the alternative, and specifically how effectively an alternative meets the RAOs. This criterion is considered a threshold criterion, and must be met by the selected alternative to be considered for use at Parcel E-2.

2. Compliance with ARARs. This criterion is used to determine whether the alternative will meet all identified federal and state ARARs and, if not, whether justification exists for waiving one or more of the ARARs. This criterion is also a threshold criterion that must be met by the selected alternative to be considered for use at Parcel E-2. Section 10 summarizes potential chemical-, location-, and action-specific ARARs associated with the remedial alternatives for Parcel E-2.

3. Long-Term Effectiveness and Permanence. The alternative is evaluated in terms of risk remaining at a site after RAOs have been met. The primary focus of this evaluation is the extent and effectiveness of controls used to manage the risk posed by treatment residuals or untreated wastes. The following factors are considered under this criterion:

- Adequacy of mitigation controls
- Reliability of mitigation controls
- Magnitude of the residual risk

4. Reduction in Toxicity, Mobility, or Volume. This criterion addresses the statutory preference for treatment options that permanently and significantly reduce the toxicity, mobility, or volume of the contaminants. This preference is satisfied when treatment reduces the principal threats through the following:

- Destruction of toxic contaminants

- Reduction in contaminant mobility
- Reduction of the total mass of toxic contaminants
- Reduction of total volume of contaminated media

5. Short-Term Effectiveness. This criterion addresses the effects of the alternative during the construction and implementation phase until RAOs are met. Under this criterion, the alternative is evaluated with respect to its effects on human health and the environment during implementation of the remedial action. The following factors are considered:

- Exposure of the community during implementation
- Exposure of workers during construction
- Environmental impacts
- Time required to achieve RAOs

6. Implementability. This criterion addresses the technical and administrative feasibility of implementing the alternative, and the availability of various services and materials required during its implementation. The following factors are considered:

- Ability to construct the technology
- Reliability of the technology
- Monitoring considerations
- Availability of equipment and specialists
- Ability to obtain approvals from regulatory agencies

7. Cost. This criterion is based on estimates of capital and O&M costs for the alternative. Capital costs consist of direct and indirect costs. Direct costs include equipment, labor, and materials purchased as necessary to implement the alternative. Indirect costs include engineering, financial, and other services such as testing and monitoring. Annual O&M costs for each alternative include operating labor, maintenance materials and labor, auxiliary materials, and energy costs.

The cost estimate for each alternative is projected to range from 50 percent above to 30 percent below the actual cost. For estimating purposes, the post-closure O&M period is assumed to be 30 years based on landfill post-closure requirements. All costs are converted to a present value cost to allow comparison between alternatives with varying cash flow requirements over time.

8. State Acceptance. State acceptance is a modifying criterion used to evaluate technical and administrative issues and concerns of the State regarding the alternative. This criterion will be addressed in the ROD following comment on the RI/FS and the proposed plan.

9. Community Acceptance. Community acceptance is a modifying criterion used to evaluate technical and administrative issues and public concerns associated with the alternative. This criterion will be addressed in the ROD following comment on the RI/FS and the proposed plan.

The subsections below evaluate each alternative against these nine criteria. Table 13-1 provides a cost comparison of all the alternatives, and Appendix R provides detailed cost estimates and assumptions for each alternative.

13.1. ALTERNATIVE 1: NO ACTION

Under the no action alternative, no remedial action would take place. Solid waste, soil, and sediment would be left in place; groundwater and surface water would not be contained or treated. The no action alternative would not involve any response actions (e.g., monitoring, institutional controls, containment, removal, treatment, or other mitigating actions). The no action alternative is included throughout the FS process as required by the NCP to provide a baseline for comparison to and evaluation of other alternatives.

13.1.1. Overall Protection of Human Health and the Environment

This alternative would not provide adequate protection of human health and the environment because solid waste, soil, and sediment contributing to human health and ecological risk would not be removed, contained, or treated. Migration of soil contamination to off-site locations through stormwater erosion would be possible. In addition, erosion could expose additional solid waste, increasing potential risks to human and ecological receptors through direct contact. The potential for leachate generation and migration from infiltration would not change from existing conditions under this alternative. The lack of institutional controls would provide no means of implementing various land use restrictions needed to control unacceptable exposure to the known COCs at the site. Furthermore, this alternative does not provide any mechanisms for monitoring potential contaminant migration in landfill gas, surface water, or groundwater. Therefore, the no action alternative does not meet this threshold criterion.

13.1.2. Compliance with ARARs

There is no need to identify ARARs for the no action alternative because ARARs apply to "any removal or remedial action conducted entirely on-site" and "no action" is not a removal or remedial action. CERCLA § 121 (42 USC § 9621) cleanup standards for selection of a Superfund remedy, including the requirements to meet ARARs, are not triggered by the no action alternative (EPA, 1991). Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

13.1.3. Long-Term Effectiveness and Permanence

The no action alternative would not provide long-term effectiveness or permanence because potential exposures to known areas of contamination would not be controlled. The risk associated with exposure to solid waste, soil, sediment, landfill gas, and groundwater would not be reduced by remedial action or controlled through institutional controls. In addition, the existing control systems (landfill cap, gas control system, and stormwater BMPs) would not be maintained and would be considered unreliable to control future exposures. Consequently, the performance of Alternative 1 relative to this criterion is low.

13.1.4. Reduction in Toxicity, Mobility, or Volume

The no action alternative would not reduce the toxicity, mobility, or volume of solid waste, soil, sediment, landfill gas, or groundwater because none of these media would be treated, contained, or removed. In fact, the shut down of the currently operational gas control system would presumably result in increases in landfill gas toxicity, mobility, and volume. Therefore, the performance of Alternative 1 relative to this criterion is low.

13.1.5. Short-Term Effectiveness

This alternative would not have any adverse short-term impacts because it would not involve remediation activities that might pose risks to the community, workers, or the environment. Therefore, the performance of Alternative 1 relative to this criterion is high.

13.1.6. Implementability

No resources are required to implement this alternative, and no known administrative considerations would impact its overall implementability. Therefore, the performance of Alternative 1 relative to this criterion is high.

13.1.7. Cost

There are no capital or O&M costs associated with the no action alternative.

13.1.8. State and Community Acceptance

The State and community acceptance criteria will be assessed in the ROD following comment on the RI/FS and the proposed plan.

13.1.9. Summary of Detailed Analysis for Remedial Alternative 1

Because Alternative 1 did not meet the first threshold criterion (overall protection of human health and the environment, Subsection 13.1.1), it is not considered an acceptable alternative, and is retained only to provide a baseline for comparison to and evaluation of other alternatives.

13.2. ALTERNATIVE 2: EXCAVATION AND DISPOSAL OF SOLID WASTE, SOIL, AND SEDIMENT (INCLUDING MONITORING AND INSTITUTIONAL CONTROLS)

Alternative 2 would involve excavation and off-site disposal of all solid waste, debris, and soil in the Landfill Area. Isolated solid waste locations and soil in the Panhandle Area and East Adjacent Area, as well as sediment within the Shoreline Area, would also be excavated and disposed of off site. Groundwater monitoring would also be included under this alternative to evaluate chemical concentrations in groundwater while the aquifers naturally recover. Additionally, groundwater monitoring would be used to confirm site conditions and to ensure that, over time, the potential exposure pathways would remain incomplete. This alternative would also include institutional controls (consisting of access restrictions, land use restrictions, and covenants to restrict use of property) that would be

implemented across the entire parcel to prevent exposure to COCs in soil and groundwater. In the adjacent areas, wetlands disturbed during the excavation activities would be restored on top of the clean fill.

13.2.1. Overall Protection of Human Health and the Environment

Under Alternative 2, the removal of contaminated solid waste, soil and sediment from Parcel E-2 would serve to protect human health and the environment by: 1) eliminating potential exposure of receptors to contaminated solid waste, soil, or sediment through direct contact or inhalation; 2) reducing or eliminating landfill gas generation and migration; and 3) removing potential sources that could contaminate groundwater and surface water. In addition, the implementation of institutional controls would reduce the potential human exposure to subsurface soil (greater than 3 feet bgs) in the adjacent areas and groundwater throughout Parcel E-2. Therefore, Alternative 2 meets this threshold criterion.

13.2.2. Compliance with ARARs

Alternative 2 would meet all chemical-, location-, and action-specific ARARs that come into effect during remedy implementation, including those related to excavation and off-site disposal, institutional controls, and site monitoring.

Alternative 2 would meet the potential chemical-specific ARARs (identified in Section 10) for groundwater and air. This determination presumes that institutional controls, which restrict the use of groundwater, will remain in place until the groundwater chemical concentrations have attenuated to less than remediation goals. The removal of the landfill solid waste would reduce or eliminate landfill gas generation and migration. In addition, Alternative 2 would meet the various chemical-specific ARARs for waste characterization that would be triggered by the excavation and disposal of solid waste, soil, and sediment.

Alternative 2 would meet the potential location-specific ARARs identified for the protection of coastal, wetlands, and biological resources by adhering to the substantive requirements of each ARAR. These actions would include wetlands mitigation.

Alternative 2 would meet the potential action-specific ARARs for excavation and disposal, institutional controls, and monitoring of surface water and groundwater. Potential action-specific ARARs for long-term gas monitoring, solid waste containment, and leachate collection and control would not be triggered because the landfill solid waste would be removed.

Alternative 2 meets this threshold criterion.

13.2.3. Long-Term Effectiveness and Permanence

Under Alternative 2, solid waste, soil, and sediment posing unacceptable risk would be permanently removed. In addition, the removal of the contaminant sources (contaminated solid waste, soil, and sediment) would likely reduce any residual concentrations of COCs in groundwater and eventually allow restrictions on B-aquifer groundwater use to be removed once chemical concentrations have attenuated to

less than the remediation goals. In addition, institutional controls would require that workers adequately protect themselves from exposure when conducting activities that may lead to groundwater exposure. Consequently, the performance of Alternative 2 relative to this criterion is high.

13.2.4. Reduction in Toxicity, Mobility, or Volume

The removal actions proposed under Alternative 2 would not reduce the volume of contaminated solid waste, soil, or sediment because the material would be transferred to another location. However, the excavated material would be placed at a licensed disposal facility with engineered containment systems. In addition, because some of the excavated material might require treatment prior to disposal, there could be a reduction in the toxicity and mobility of contaminants in the material.

The volume of contaminated A-aquifer groundwater in the Landfill Area would be reduced by the extraction and treatment required as part of the excavation process, and the excavation of potential PCB and TPH soil sources (up to 10 feet bgs) would likely reduce the toxicity of groundwater in these areas. However, these removals would not reduce concentrations of hazardous substances in groundwater throughout Parcel E-2, and institutional controls and long-term groundwater monitoring would be required to protect human health and the environment. Therefore, the performance of Alternative 2 relative to this criterion is moderate.

13.2.5. Short-Term Effectiveness

Alternative 2 would involve the potential exposure of site workers and the surrounding community to contaminants during the estimated four years of excavation and disposal of solid waste, soil, and sediment throughout Parcel E-2. In addition, the re-exposure of buried waste to the atmosphere would accelerate the decay of putrefiable wastes, which would produce offensive odors. Institutional controls, engineering controls, and site monitoring would be implemented to mitigate, but not eliminate, the potential exposure of site workers and the surrounding community. Institutional controls would ensure the proper training of site workers. Engineering controls would limit exposures by restricting site access to trained personnel, using dust control methods to reduce wind-blown contaminants, and implementing stormwater BMPs to control suspended sediment in surface runoff. Site monitoring would track potential contaminant migration during construction.

The proposed removal of all solid waste and soil within the Parcel E-2 Landfill presents the most acute risk to site workers relative to other actions proposed under Alternative 2. This determination is based on the uncertainty of the waste types found in the landfill, and the excavation depth required for the complete removal of solid waste and contaminated soil. If not implemented properly, deep excavation in saturated solid waste and debris could cause slope failure hazards during excavation, which in turn could jeopardize surrounding buildings and facilities. Proper engineering design and installation of a sheet pile wall would minimize, but not eliminate, this risk.

Removal, storage, and treatment of contaminated solid waste, soil, sediment, and water would increase the potential for spills. This alternative assumes that wastes would be loaded onto rail cars on site and

transported to the disposal facility by rail (rather than by trucks traveling through the community to transport the waste to a rail yard). Because of the anticipated volume of solid and liquid wastes, trucking waste through the community would substantially increase road traffic in the local community. This traffic would increase the potential for spills or accidents that could expose the community to contaminants. The risk of spills and accidents is greatly reduced by using on-site rail loading because:

- Fewer waste transfers must be made (from the site directly to rail car, as opposed to the two-phase site to truck and then truck to rail car)
- Rail cars would not be required to travel on community roads
- Fewer trips would be generated, as a fully-loaded rail car would haul more than a truck and multiple rail cars would be transported together

As discussed above, Alternative 2 would pose short-term risks to site workers and the surrounding community during the estimated 4-year period required to excavate and dispose of solid waste, soil, and sediment throughout Parcel E-2. These risks would be minimized, but not eliminated, by the use of institutional controls, engineering controls, and site monitoring. In light of these risks, the performance of Alternative 2 relative to this criterion is low.

13.2.6. Implementability

Although excavation and off-site disposal is a common remediation technology that has been successfully implemented at HPS, the size and scale of the excavation proposed under Alternative 2 presents numerous technical barriers that must be overcome for successful implementation. As discussed in Subsection 13.2.5, the excavation of all solid waste and soil in the landfill would present acute risks to site workers that would be mitigated with various controls, such as the installation of sheet piling around the landfill. The large excavation volumes considered under Alternative 2, coupled with the heterogeneous site conditions, make such controls difficult to implement. In addition, the proximity of the excavation areas to the Bay present implementation issues associated with controlling releases into the Bay and preventing flooding during high tides. Administrative barriers are not anticipated; however, local citizens may be concerned about the increased rail and road traffic required for implementation (e.g., waste transportation for off-site disposal, construction equipment and supply mobilization/demobilization, importation of backfill soils). The technical difficulties and uncertainties associated with this alternative are described below.

The presence of subsurface debris, such as very large concrete debris encountered during the installation of the existing gas control system, would increase the difficulty and expense of installing a sheet pile wall around the landfill needed to minimize groundwater intrusion and improve excavation stability. If a sheet pile wall is not installed, additional cut-back of slopes would be necessary to provide sufficient stability, and would require excavation of adjoining non-Navy property or portions of the Bay. In addition, without a sheet pile wall, it would be very difficult to control the intrusion of Bay water into the excavation. Presuming that the Landfill Area could be successfully excavated, the proper placement and

compaction of backfill on the soft Bay Mud would be difficult. If sufficient compaction of the lower layers could be achieved, proper compaction of overlying layers would also be difficult to achieve.

The degree of characterization performed at Parcel E-2 is considered sufficient for evaluation of a remedial alternative, but is insufficient to precisely characterize the excavated materials for off-site disposal. Given the large volume and heterogeneous nature of the fill at Parcel E-2, the evaluation of excavated materials and determination of off-site treatment and disposal requirements makes Alternative 2 difficult to implement. For example, all of the estimated 1,162,000 cubic yards of material proposed for excavation from Parcel E-2 would require screening for radioactivity, and this process would require nearly three years to complete.

Based on the factors discussed above, the performance of Alternative 2 relative to this criterion is low.

13.2.7. Cost

The capital cost of this alternative is estimated at $342 million. Major capital expenditures would be required for the excavation, characterization, segregation, and disposal of excavated material from Parcel E-2. O&M costs are estimated at $3.8 million, and consist of institutional controls and groundwater, stormwater, and wetlands monitoring. Including other periodic costs over the 34-year implementation period (4 year construction period and 30 years of monitoring), the estimated present value for this alternative is $330 million.

Unanticipated waste treatment and disposal requirements for the excavated materials affect the estimated costs. With the exception of cover soil material in the existing multilayer cap, all material excavated from the landfill and adjacent areas were assumed to require disposal at an off-site waste landfill. Cover soil material in the existing multilayer cap was assumed to be clean, and reusable as backfill material. For cost estimating purposes, approximately 35 percent of the material excavated from the site would be disposed of as D008 (RCRA Lead) waste, 50 percent as non-RCRA hazardous waste, 10 percent as nonhazardous waste, and 5 percent as low-level radiologically-impacted waste (including mixed waste). These waste fractions were estimated using preliminary waste characterization data from the removal actions currently being conducted at Parcel E-2. To reduce costs and road traffic through the local community, it was assumed that all hazardous material would be loaded onto rail cars on site and transported via rail to a disposal facility.

Because of the high costs, the performance of Alternative 2 relative to this criterion is low (that is, it has a low cost-effectiveness).

13.2.8. State and Community Acceptance

The State and community acceptance criteria will be assessed in the ROD following comment on the RI/FS and the proposed plan.

13.2.9. Summary of Detailed Analysis for Remedial Alternative 2

Alternative 2 meets the two threshold criteria, and would serve as an effective and permanent remedy in the long term. However, there are numerous issues regarding the short-term effectiveness, implementability, and cost of Alternative 2. This finding is consistent with EPA's finding, based on an examination of FS documents for 30 CERCLA municipal landfills, that technologies associated with collection, treatment, and discharge were routinely screened out, primarily because of their difficult implementation and high cost (EPA, 1994).

As presented in Subsection 8.8.1, the Parcel E-2 Landfill meets all of the criteria specified in EPA guidance for application of the containment presumptive remedy. However, the Navy has agreed to fully evaluate Alternative 2 in order to provide information to support the community's review of potential remedial alternatives for Parcel E-2, and will therefore retain it for comparative analysis in Section 14.

13.3. ALTERNATIVE 3: CONTAINMENT OF SOLID WASTE, SOIL, AND SEDIMENT (INCLUDING MONITORING AND INSTITUTIONAL CONTROLS)

Alternative 3 involves the containment of: 1) solid waste and soil in the Landfill Area, with a multilayer cap; 2) solid waste, soil, and sediment in the adjacent areas, with a geosynthetic cap; and 3) landfill gas, with an active collection and treatment system. This alternative would provide a comprehensive closure strategy for Parcel E-2 that extends the existing cap over the entire landfill, with additional capping over the adjacent areas. Two variations of Alternative 3 are presented in Table 13-1 and Appendix R. Alternatives 3A and 3B are identical except for the landfill gas treatment method. Alternative 3A assumes that a flare would be used to treat the landfill gas, while Alternative 3B assumes that GAC and potassium permanganate would be used for landfill gas treatment. Section 11 provides descriptions of these two landfill gas treatment options, as well as other alternative treatment options. All gas treatment options were retained during the evaluation of technologies and process options, pending the results of a gas generation study that will better determine the characteristics of the landfill gas. Finally, Alternative 3 would be constructed to allow freshwater and tidal wetlands to be restored on top of the cap in the Panhandle and Shoreline Areas.

13.3.1. Overall Protection of Human Health and the Environment

Alternative 3 would protect human health and the environment by preventing unacceptable human or ecological exposure to contaminated solid waste, soil, and sediment at Parcel E-2. The combination of containment through capping and implementation of institutional controls would prevent human and ecological receptors from direct contact, incidental ingestion, and inhalation of eroded waste particulates. Landfill gas would be controlled, extracted, and treated (if necessary) by the gas collection system.

Human health and the environment would be protected from groundwater contamination through institutional controls to prevent exposure to groundwater within the Parcel E-2 and regular monitoring to ensure that groundwater concentrations at the point of compliance do not exceed chemical-specific

ARARs. In addition, potential migration of groundwater contamination would be controlled because the low-permeability cap would significantly reduce infiltration relative to existing conditions. Therefore, Alternative 3 meets this threshold criterion.

13.3.2. Compliance with ARARs

Alternative 3 would meet the potential chemical-specific ARARs (identified in Section 10) for groundwater and air. This determination presumes that the groundwater monitoring program will confirm that A- or B-aquifer groundwater concentrations at the Parcel E-2 boundary (the point of compliance) do not exceed the potential chemical-specific ARARs. The gas control system would prevent unacceptable concentrations of methane or NMOCs from moving past the compliance point or migrating into nearby structures. In addition, Alternative 3 would meet the various chemical-specific ARARs for the proper characterization of IDWs (from activities such as monitoring well replacement).

Alternative 3 would meet the potential location-specific ARARs identified for the protection of coastal, wetlands, and biological resources by adhering to the substantive requirements of each ARAR. These actions would include wetlands mitigation.

Alternative 3 would meet all of the potential action-specific ARARs for landfill gas control, institutional controls, and monitoring of surface water, groundwater, and landfill gas. Potential action-specific ARARs for leachate collection and control would be met provided that unacceptable concentrations are not detected in A-aquifer groundwater at the Parcel E-2 boundary. Alternative 3 would meet all of the potential action-specific ARARs for containing solid waste.

Consequently, Alternative 3 meets this threshold criterion.

13.3.3. Long-Term Effectiveness and Permanence

Under Alternative 3, the final control systems (cap, gas control system, and stormwater BMPs) would control potential exposure to contaminated solid waste, soil, and sediment; control landfill gas migration; and prevent off-site transport of contaminated soil via stormwater erosion. With proper maintenance and monitoring, closure of the landfill and adjacent areas would be both effective and permanent in the long-term. The cap system would also be designed for stability under static and earthquake conditions. Although Parcel E-2 has a predicted liquefaction potential, perimeter slopes would be designed with a synthetic soil reinforcement material to limit the effects of settlement and slope instability during potential soil liquefaction. In addition, institutional controls would increase the effectiveness of the remedy by establishing legal and administrative mechanisms to manage the control systems and to ensure that land uses are compatible with the final cap.

The landfill gas collection system would be designed with sufficient capacity to handle any anticipated variations in future landfill gas generation rates. Because of the age of the landfill, landfill gas generation rates are expected to decline slowly in the future; therefore, with proper O&M, the landfill gas collection system would effectively control landfill gas migration in the long term until landfill gas generation

ceases to be a concern. Landfill gas treatment, if necessary, would effectively prevent unacceptable risks from inhalation.

Presuming that the groundwater monitoring program will verify that A- or B-aquifer groundwater concentrations at the Parcel E-2 boundary (the point of compliance) do not exceed the potential chemical-specific ARARs, Alternative 3 could be effective in protecting human health in the long term because institutional controls would prohibit the use of Parcel E-2 aquifers as a source of drinking water, and require that workers adequately protect themselves from exposure when conducting activities that may lead to groundwater exposure. With the installation of the cap and associated reduction in infiltration and leachate generation, potential contaminant migration in groundwater would be reduced.

Based on the discussion above, the long-term effectiveness and permanence of this alternative would be moderate to high.

13.3.4. Reduction in Toxicity, Mobility, or Volume

Under Alternative 3, operation of the control systems would reduce the mobility of several contaminated media by containing solid waste, soil, and sediment, controlling landfill gas migration, limiting infiltration and potential leachate generation, and preventing off-site transport of contaminated soil via stormwater erosion. However, with the exception of potential landfill gas treatment, this alternative involves containment and not active treatment; thus, the toxicity and volume of contaminated media would not be reduced. The performance of Alternative 3 relative to this criterion is moderate.

13.3.5. Short-Term Effectiveness

Under Alternative 3, the surrounding community and site workers could be exposed to dust, noise, and increased construction traffic during the estimated two years required to construct the cap and associated control systems. This exposure would be greatest during excavation and grading in the Shoreline Area and Panhandle Area. The risk of exposure to landfill contaminants or landfill gas would be low because disturbance of the landfill contents would be minimized.

Site workers could be exposed through direct contact with waste materials. This exposure would be minimized through the use of institutional controls to ensure the proper training of site workers, engineering controls to minimize airborne dust, and site monitoring to track potential contaminant migration during construction. In addition, the risk of contaminant release to the Bay during construction in the adjacent areas would be alleviated through engineering controls (such as silt curtains and stormwater BMPs) to restrict sediment transport. Alternative 3 has moderate to high short-term effectiveness.

13.3.6. Implementability

Containment is the EPA's recommended remedy for CERCLA municipal landfills. The technologies for constructing the cap and landfill gas control system at Parcel E-2 have been frequently used throughout the United States, and more specifically, are proven and accepted technologies in the San Francisco Bay

Area. Construction methods would involve industry standard practices and equipment commonly employed in landfill cap construction. Experienced construction personnel, materials, services, and equipment would be readily available. Implementation along the shoreline may prove difficult because of the depth of some waste that must be excavated in order to construct stable slopes; however, engineering controls could be designed to allow for successful excavation. Surface water controls would be required to prevent inundation of working areas from the tides and to prevent transport of contaminated materials into the Bay. For the grading activities in the Panhandle Area, deeper excavation may require dewatering and associated water management, disposal, or treatment.

Coordination, consultation, and the general support of public agencies, including EPA Region IX, DTSC, RWQCB, CIWMB, BAAQMD, and the City and County of San Francisco, is anticipated. This alternative is considered to be administratively implementable. The Navy would be responsible for establishing and maintaining institutional controls until the time of transfer.

Based on the factors discussed above, the performance of Alternative 3 relative to this criterion is moderate.

13.3.7. Cost

The total capital cost of this alternative is estimated to be approximately $60.4 million for Alternative 3A (enclosed flare for landfill gas treatment) and $60.1 million for Alternative 3B (carbon adsorption for landfill gas treatment). O&M costs for Alternatives 3A and 3B are $21.2 million and $23.5 million, respectively. The cost for the wetlands restoration is $69.9 thousand per acre. Including other periodic costs over the 32-year implementation period (2 year construction period and 30 years of monitoring), the estimated present values for Alternatives 3A and 3B are $72.8 million and $73.9 million, respectively.

13.3.8. State and Community Acceptance

The State and community acceptance criteria will be assessed in the ROD following comment on the RI/FS and the proposed plan.

13.3.9. Summary of Detailed Analysis for Remedial Alternative 3

Alternative 3 meets the two threshold criteria, and would serve as an effective and permanent remedy in the long-term. The control systems to be used to maintain the protectiveness of the alternative would require regular O&M, along with site monitoring, to ensure its effectiveness. Alternative 3 presents some challenges to ensure its short-term effectiveness and successful implementation; however, similar caps have been constructed throughout the San Francisco Bay Area. Overall, Alternative 3 is considered a feasible alternative, and will be retained for comparative analysis in Section 14.

Tables

Table 13-1 Cost Estimate Summaries
Hunters Point Shipyard Parcel E-2, Remedial Investigation/Feasibility Study

Remedial Alternative	Total Capital Cost	Total O&M Cost	Total Periodic Cost	Period of Analysis	Total Cost	Present Value[(1)]
1	$ -	$ -	$ -	NA	$ -	$ -
2	$ 342,124,985	$ 3,831,834	$ 139,285	34 years	$ 346,096,104	$ 330,489,065
3A	$ 60,396,245	$ 19,925,430	$ 754,655	32 years	$ 81,076,330	$ 71,971,913
3B	$ 60,077,045	$ 22,193,430	$ 754,655	32 years	$ 83,025,130	$ 73,100,295

Notes:

[(1)] Based on a 3% discount factor, as specified for Federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (effective January 2006 through January 2007, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)

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