Executive Summary

The purpose of the Engineering Evaluation/Cost Analysis (EE/CA) Executive Summary is to provide, in a standalone document, the key information contained in the EE/CA Report so that its content and findings can be understood without having to read the entirety of the document. The Executive Summary contains a summary of the site description including investigation results and an updated conceptual site model based on the investigation results. A summary of the risk assessment and of applicable or relevant and appropriate requirements (ARARs) is also included along with the scope and objectives of the removal action. The final sections of the Executive Summary provide information on the removal action alternatives analyzed and the recommended removal action.

ES 1. Introduction and Purpose

The El Capitan Former Waste Disposal Area (the Site) is located within the Yosemite National Park (the Park) in the state of California, which is owned by the United States and managed by the National Park Service (NPS). The Site is being investigated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). NPS is the lead agency under CERCLA, and the investigation is subject to an agreement between the California Department of Toxic Substances Control (DTSC) and the U.S. Department of the Interior (USDOI), NPS. NPS retained CDM Federal Programs Corporation (CDM Smith) to perform an investigation/study at the Site and prepare this EE/CA Report.

Preparation of this EE/CA fulfills the CERCLA requirement of Section 300.415 (b)(4)(i) of the National Contingency Plan (NCP) to evaluate the nature and extent of contamination at the Site and document selection of a recommended response action (in this case a removal action) for a Site where environmental contaminants present a potential risk to human health or ecological receptors, but where the removal action is non-time-critical.

This document has been prepared in accordance with the Yosemite National Park Agreement (Agreement) (Docket HWCA: P1-99/00-006), effective date March 6, 2001, between the DTSC and the NPS. Pursuant to the terms of the Agreement, this document is intended to comply with the requirements of CERCLA Sections 104 and 120 and of the State of California Hazardous Waste Management Program, which is codified in Chapter 6.5 of Division 20 of the California Health and Safety Code. The DTSC is authorized to administer the state's Hazardous Waste Management Program in lieu of the federal hazardous waste management requirements of the Resource Conservation and Recovery Act (RCRA), 42 United States Code (USC) Section 6901, et. seq.

The purpose of the EE/CA is to document the environmental review and removal action selection process and provide a framework for evaluating and selecting alternative technologies. The EE/CA identifies removal action objectives (RAOs) of the non-time-critical removal and analyzes the effectiveness, implementability, and cost of removal action alternatives that may be used to satisfy the RAOs.

ES 2. Site Description, Investigation Results, and Conceptual Site Model

The Site is located on the western side of the Sierra Nevada Range in central California, approximately 2.7 miles west of Yosemite Village along Northside Drive. Archeological investigations conducted in 1984, 1991–1992, and 2001 concluded that the Site was used for waste disposal from 1905 (or earlier) into the 1930s. The types of debris observed consist primarily of metal, glass, and ceramic, which likely had originated from the hotels and camps active in the Yosemite Valley at the time, as suggested by the manufacturing dates on materials and types of materials recovered during excavations (NPS 1990).

In 1991 and 1992, the NPS screened the soil at the Site to remove the large pieces of trash. The Site was then regraded to approximately the grade prior to waste disposal activities and replanted (DTSC 1999). In 1996 and 1997, major floods in Yosemite Valley might have modified the debris exposures observed in 1980, and during the 1991–1992 archeological investigations.

The Site is currently undeveloped with the exception of a foot trail that crosses the Site. Because of its proximity to the scenic Merced River, hikers travel through the Site frequently (Shaw Environmental, Inc. [Shaw] 2011). According to the Final Merced River Final Comprehensive Management Plan and Environmental Impact Statement (MRP), the Site is designated as a meadow restoration area (NPS 2014a). Planned activities as part of the meadow restoration include re-routing of the Valley Loop Trail to an upland area, re-vegetating abandoned sections of the Valley Loop Trail with native meadow species, and removing informal trails to reduce meadow fragmentation. Additional management activities may include re-vegetation, prescribed fire, mechanical removal of conifers, and infrastructure redesign (NPS 2014a).

In July 2014, an Approval Memorandum was prepared by the Park and signed by the NPS Regional Director for a non-time-critical removal action (NTCRA) to be conducted at the Site via an EE/CA investigation. In coordination with NPS and DTSC, a sampling and analysis plan (SAP), site-specific health and safety plan (HASP), and community involvement plan (CIP) were prepared in 2015. In November 2015, NorCal completed a geophysical survey of the Site, using vertical magnetic gradient, electromagnetic terrain conductivity, and ground-penetrating radar methods. The geophysical survey revealed substantially larger areas of subsurface waste than previously identified. Since the previously identified waste area was fairly well-bounded, NPS decided to plan for staggered field sampling investigations at the Site (two separate phases) to allow for a second geophysical survey to be conducted at the Site the following year, in an attempt to fully capture the site boundaries. During this period, sediment and porewater sampling within the river and field sampling via X-ray fluorescence (XRF) were performed within surface soil to delineate an area with elevated concentrations of lead.

In July 2016, NorCal completed a second geophysical survey at the Site within the Phase 2 area. The survey fully captured the boundaries of subsurface waste at the Site. In September 2016, an amendment to the SAP was prepared and implemented through the Phase 1 soils investigation at the Site. A combination of test trenches (31) and test pits (10) were excavated to delineate boundaries of subsurface waste. Seven decision units (DUs) (DU1 through DU7) were sampled using incremental sampling methodology (ISM) in the surface (0 to 6 inches below ground surface [bgs]) and subsurface soils (6 to 48 inches bgs). Concurrent to the excavation field work at the Site, the cultural resources firm (Pacific Legacy) conducted historical archeological data recovery treatment measures to avoid an adverse effect determination to CA-MRP-1196H (the archeological identifier for the Site). These measures involved implementing an archeological work plan of field monitoring and research that would lead to refined understanding of the Site's cultural resources. Pacific Legacy also performed site surface inventory and mapping activities within the Phase 2 area.

In 2017, additional test trenches were excavated to delineate boundaries of subsurface waste within the Phase 2 area. Six site DUs (DU8 through DU12 and DU15) and one background DU (DU 16) were sampled using ISM in the surface (0 to 6 inches bgs) and subsurface soils (6 to 48 inches bgs). In addition, groundwater monitoring was conducted at 13 temporary sampling locations. Sample locations included areas identified as upgradient of the waste, within the waste areas (G04–G06; Site DU), and downgradient of the waste areas.

The conceptual site model (CSM) summarizes the current understanding of how chemical contaminants have been released to the environment. The Site was used as a waste disposal area from approximately 1905 to early 1930s. Waste debris at the Site includes domestic trash, glass, ceramics, automotive machinery and related wastes, paint cans, 55-gallon drums, and a layer of burned material that was thought to be the result of regular on-site burning. Although most large pieces of trash (e.g., drums) were removed during the 1992 soil screening activities, larger items of debris were noted during the 2014 site visit. Site investigations have shown that waste debris is distributed across the Site, primarily within the top 4 feet of soil, in a series of distinct debris zones (see Figure 3). Based on the type of waste present, the Site may be impacted by metals (from paint and construction, farm-related equipment, and automotive machinery), polycyclic aromatic hydrocarbon (PAHs) (oil spills from automotive parts), pentachlorophenol (PCP) (a wood preservative for power line poles and fences), total petroleum hydrocarbons (TPH) (from motor oil or diesel), and dioxins (from regular burning of wastes). The CSM considered several migration pathways (air transport, surface transport, groundwater transport, uptake into living organisms) and both human and ecological receptors.

ES 3. Risk Assessment Summary

The human health risk assessment (HHRA) was prepared in accordance with U.S. Environmental Protection Agency (USEPA) guidance on conducting HHRAs in support of the Superfund program (USEPA 1989) and DTSC Office of Human and Ecological Risk (HERO) guidance for conducting risk assessments for human health. The HHRA was conducted using the soil and groundwater data collected during the 2015–2017 site investigation.

Human Health

The HHRA evaluated potential risks to humans, both now and in the future, from exposures to contaminants that may be present at the Site due to the waste debris, assuming no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media.

The Site is primarily used by humans for recreational and occupational purposes. The receptor populations of interest for the risk assessment include park visitors, NPS employees, and construction workers. The HHRA included an evaluation of chronic exposures to both lead and non-lead contaminants of potential concern (COPCs) in soil (surface and subsurface) and surface water in the Merced River (as estimated from groundwater).

Chronic exposures and risks to humans from non-lead COPCs were evaluated based on both cancer and non-cancer effects. Estimated total overall risks to park visitors, NPS employees, and construction workers were below NPS's acceptable risk thresholds for non-cancer and cancer effects (i.e., cancer risks were at or below 1E-06 and non-cancer hazards were less than 1). Based on these thresholds, it is concluded that site-related chronic exposures to non-lead COPCs would not result in unacceptable risks for any current or future recreational and occupational receptor populations.

Risks from lead were evaluated using a different approach, in which exposure models were used to estimate the concentration of lead in blood for women of child-bearing age. For convenience, the concentration of lead in blood is usually abbreviated PbB. The lead exposure modeling results show predicted PbB levels from site exposures would not exceed target PbB levels of concern for on-site workers. In addition, a qualitative evaluation of potential lead exposures for child park visitors suggests short-term exposures to lead are likely to be below a level of concern. Based on these results, it is concluded that site-related exposures to lead would not result in unacceptable risks.

Although there are no direct exposure pathways to groundwater under current conditions and use of groundwater as drinking water is not anticipated in the future, if site groundwater were to become a drinking water source in the future, exposures from several metals, PAHs, and PCP have the potential to result in unacceptable exposures

Ecological Risk

A screening-level ecological risk assessment (SLERA) is a simplified ecological risk assessment (ERA) that can be conducted with limited data where site-specific information is lacking and assumed values are used to evaluate potential exposure and effects (USEPA 1997). The goal is to eliminate insignificant hazards while identifying contaminants whose concentrations are sufficiently high to potentially pose risks to ecological receptors.

The SLERA identified the list of COPECs for further evaluation in the baseline ecological risk assessment (BERA). Based on the BERA, several chemicals in soil, sediment porewater, and surface water have the potential to be present at concentrations that may result in unacceptable ecological exposures.

There are several different evaluation methods, or lines of evidence, that can be used in the BERA for determining the impact of site releases on ecological receptors (e.g., hazard quotient [HQ] estimates, toxicity tests, and habitat and community evaluations). Each of these lines of evidence has inherent advantages and limitations. For this reason, conclusions based on only one line of evidence may be incomplete. The best approach for reaching reliable conclusions about potential ecological risks is to combine the findings across all the evaluation methods for which data are available, taking the relative strengths and weaknesses of each method into account. If the methods all yield similar conclusions, confidence in the conclusion is increased. If different methods yield different conclusions, a careful review must be performed to identify the basis of the discrepancy (if possible) and decide which methods provide the most reliable information.

With the exception of sediment exposures for aquatic receptors, only one line of evidence—HQs—is available for characterizing potential ecological risks at the Site. Thus, risk conclusions should be viewed as having substantial uncertainty, and HQ values presented in this risk assessment should generally be viewed as being more likely to be high than low.

A screening-level evaluation of site groundwater data suggests several PAHs, and possibly barium and copper, have the potential to be chemicals of ecological concern (COECs) in surface water if groundwater were to migrate unattenuated to surface water. There are no measured surface water data to determine if unacceptable levels are actually present in the Merced River; thus, the data are too limited to draw any definitive risk conclusions.

The evaluation of aquatic invertebrate exposures to sediment shows barium and nickel in sediment porewater have HQs greater than or equal to 1, which indicates these COECs have the potential to adversely impact sediment-dwelling aquatic invertebrates at the Site. However, elevated levels of barium and nickel in sediment porewater do not appear to be attributable to bulk sediment but are likely due to interaction between local groundwater and the riverbed.

For plants and invertebrates, the HQ results show several metals have elevated soil concentrations in a few site DUs above levels that could potentially result in adverse impacts for terrestrial plants and/or soil

invertebrate communities. The key risk drivers were copper, lead, and zinc for terrestrial plants and copper, mercury, and zinc for soil invertebrates.

For mammals and birds, no-observed-adverse-effect-level (NOAEL) based HQs were greater than 1 for one or more site DUs for antimony, cadmium, copper, lead, mercury, vanadium, zinc, and dioxins/furans (toxic equivalent quotient [TEQ]) for exposures to surface soil and terrestrial food items. In addition, estimated HQs also were greater than 1 for most of these COECs for burrowing mammal exposures to subsurface soil. However, lowest-observed-adverse-effect-level (LOAEL) based HQs were only above 1 for antimony, cadmium, and copper in a few DUs. For both mammals and birds, insectivorous receptors tended to have higher HQs than the other two feeding guilds (i.e., herbivores, carnivores). This is not unexpected as bioaccumulation of contaminants into terrestrial invertebrate (earthworm) tissues often tends to be greater than into plants and small mammal tissue. Thus, if risk management decisions are based on this feeding guild, they will be adequately protective of other feeding guilds with lower exposures.

With the exception of vanadium, soil concentrations of all COPECs were higher in one or more DUs relative to background, which suggests on-site soil concentrations are attributable, at least in part, to site-related impacts.

ES 4. Identification and Analysis of Applicable or Relevant and Appropriate Requirements

The identification of ARARs is the prerequisite to selecting a cleanup action (USEPA 1992b). “Under circumstances where a NTCRA is expected to be the first and final action at the site, the selected removal action must satisfy all adopted ARARs” (USDOI 2016).

Other factors to be considered (TBCs) are non-promulgated criteria, advisories, guidance, and proposed standards issued by federal or state governments. The TBCs are not enforceable but may be appropriate to consider in certain circumstances; for example, where no ARARs identify particular protective goals.

There are four basic criteria that define ARARs (NPS 2015; USEPA 1988). The ARARs are (1) substantive rather than administrative, (2) applicable or relevant and appropriate, (3) promulgated state requirements that are more stringent than comparable federal standards, and (4) categorized as chemical-, location-, or action-specific.

The key ARARs and TBCs identified in this EE/CA are as follows:

- Chemical-specific: Key chemical-specific ARARs for the Site focus on permissible exposure limits (in accordance with the requirements of 8 California Code of Regulations [CCR] 5155) and hazardous waste determination (in accordance with the requirements of 22 CCR Division 4.5, Chapter 11, Article 1 Sections 66261.2 through 66261.3; Article 4 Sections 66261.24(a)(1), 66261.24(a)(2), 66261.30 through 66261.32; Article 4.1 Sections 66261.100, 66261.101; Chapter 18, Article 4 Sections 66268.40 66268.48; and 27 CCR Div. 2, Sub-division 1, Chapter 3, Sub-chapter 2, Article 2 Section 20210).

- Location-specific: Key location-specific ARARs for the Site include ARARs specific to national parks such as the National Park Service Organic Act of 1916, the National Park Service General Authorities Act of 1970, and national park regulations pertaining to the restrictions on waste disposal sites, the creation of nuisances, and the protection of national park resources. Other key

location-specific focus on the protection of animal and plant species that are endangered, threatened, or protected at the federal or state level and the protection of historical and cultural resources.

- Action-specific: Key action-specific ARARs are specific to each individual removal alternative. Further analysis of action-specific ARARs is conducted following the development of removal alternatives.

Pursuant to its delegated CERCLA lead agency authority, NPS has identified ARARs and TBCs for the El Capitan Waste Disposal Area EE/CA. Other agencies, including DTSC, were given the opportunity to provide input about ARARs and TBCs for the Site.

ES 5. Removal Action Objectives and Preliminary Removal Goals

The RAOs for this EE/CA are as follows:

- Prevent unacceptable risks to human and ecological receptors from exposure to chemicals of concern (COCs) and/or COECs in soil.

  This RAO aims to reduce exposure to soil that contains contaminant concentrations that are above target risk goals. The recommended removal action goals (RGs) that were developed based on risks and ARARs or TBCs are discussed in Section 5.3. Attainment of recommended RGs may be achieved through a variety of methods. Alternatives that meet this RAO also will meet the following performance standard requirements under the RCRA process: (1) attain media cleanup standards, (2) control the sources of the releases, and (3) protect human health and the environment.

- Restore groundwater to beneficial uses within a reasonable time frame.

  This RAO aims to restore groundwater to beneficial uses by reducing contaminant concentrations to below the recommended RGs. The recommended groundwater RGs that were developed based on ARARs are discussed in Section 5.3. Attainment of recommended RGs may be achieved through a variety of methods. Alternatives that meet this RAO also will meet the following performance standard requirements under the RCRA process: (1) attain media cleanup standards, (2) control the sources of the releases, and (3) protect human health and the environment

- Minimize migration of COCs and/or COECs from groundwater and soils that could result in degradation of the Merced River.

  This RAO aims to minimize the migration of contamination above recommended RGs in groundwater and soils to surface water within the Merced River. This RAO addresses the Wild and Scenic Rivers Act (16 USC Section 1271 et seq.) non-degradation and enhancement policy for all designated wild and scenic river areas, including the Merced River. The overarching goal articulated in Section 10(a) of the Wild and Scenic Rivers Act is to protect existing high-quality conditions while improving conditions when unacceptable impacts are documented, thus leaving each river to future generations in better condition than when it was designated. Non-degradation in the context of a wild and scenic river is assurance that no downward trend in conditions affect outstandingly remarkable values. This RAO will be used as an overarching guidance for all technology and alternative evaluations.

Removal alternatives that meet this RAO will meet the following performance standard requirements under the RCRA process: (1) attain media cleanup standards and (2) comply with any applicable federal, state, and local standards for management of wastes.

- Eliminate or minimize contaminant-related constraints to the full enjoyment and use of park resources for operational, scientific, and interpretive purposes consistent with NPS mandates.

  Unlike the media-specific RAO, this RAO addresses the Organic Act (16 USC Section 1) directive to conserve and to provide for the enjoyment of the scenery and the natural and historic objects and the wildlife in the Park such as to leave them unimpaired for the enjoyment of future generations. This RAO relates to how the ERA was conducted and the level of protection achieved by the recommended RGs and provides overarching guidance for all technology and alternative evaluations.

  Removal alternatives that meet this RAO will meet the following performance standard requirements under the RCRA process: (1) attain media cleanup standards, (2) control the sources of the releases, and (3) protect human health and the environment.

- Satisfy federal and state ARARs and any associated cleanup standards.

  This RAO assesses whether the removal alternatives are able to attain the federal and state ARARs identified in Table 12 through Table 14. By complying with ARARs, this RAO would satisfy RCRA requirements to comply with applicable standards.

  Removal alternatives that meet this RAO will meet the following performance standard requirements under the RCRA process: (1) attain media cleanup standards and (2) comply with any applicable federal, state, and local standards for management of wastes.

The recommended RGs are selected by comparing the risk-based preliminary removal goals (PRGs) with the ARAR and/or TBC-based PRGs and by selecting the most stringent. However, to ensure that cleanup will be technically feasible and cost-effective, the PRGs are compared to background values for COCs and COECs in all media at the Site. When multiple PRGs exist, the lower (i.e., more protective) value was chosen as the recommended RG unless the background concentration of the contaminant in the medium judged to be representative of unimpacted conditions was greater than the PRGs, in which case the background concentration was selected as the recommended RG. The recommended RGs and the basis for selection are included in Text Table ES 5.

Text Table ES 5 Soil RG Selection

COC or COEC	Background [1]	Human Health PRG	Residential RSL	Ecological PRG	ARAR/ TBC-based PRG	Basis for RG	Recommended RG
Soil							
Antimony	*<0.1 mg/kg*	*--- [2]*	*31 mg/kg*	*2.4 mg/kg*	*0.27 mg/kg*	*ARAR/TBC-Based PRG*	*0.27 mg/kg*
Arsenic	*3.1 mg/kg*	*--- [2]*	*0.68 mg/kg*	*--- [2]*	*0.29 mg/kg*	*Background*	*3.1 mg/kg*

Text Table ES 5 Soil RG Selection							
COC or COEC	**Background [1]**	**Human Health PRG**	**Residential RSL**	**Ecological PRG**	**ARAR/ TBC-based PRG**	**Basis for RG**	**Recommended RG**
Cadmium	*0.068 mg/kg*	*--- [2]*	*71 mg/kg*	*1.9 mg/kg*	*0.4 mg/kg*	*ARAR/TBC-Based PRG*	*0.4 mg/kg*
Copper	*10.6 mg/kg*	*--- [2]*	*3,100 mg/kg*	*142 mg/kg*	*46 mg/kg*	*ARAR/TBC-Based PRG*	*46 mg/kg*
Lead	*5.2 mg/kg*	*--- [2]*	*400 mg/kg*	*160 mg/kg*	*14 mg/kg*	*ARAR/TBC-Based PRG*	*14 mg/kg*
Mercury	*<0.02 mg/kg*	*--- [2]*	*23 mg/kg*	*0.060 mg/kg*	*0.1 mg/kg*	*Ecological PRG*	*0.06 mg/kg*
Vanadium	*40 mg/kg*	*--- [2]*	*390 mg/kg*	*46 mg/kg*	*None*	*Ecological PRG*	*46 mg/kg*
Zinc	*56 mg/kg*	*--- [2]*	*23,000 mg/kg*	*334 mg/kg*	*None*	*Ecological PRG*	*334 mg/kg*
Dioxin/ Furan (TEQ)	*5.2E-08 mg/kg*	*--- [2]*	*4.8E-06 mg/kg*	*2.6E-06 mg/kg*	*None*	*Ecological PRG*	*2.6E-06 mg/kg*
Groundwater							
Arsenic	*4.6 µg/L*	*--- [2]*	*0.052 µg/L*	*--- [2]*	*10 µg/L*	*ARAR/TBC-Based PRG*	*10 µg/L*
Lead [4]	*2.8 µg/L*	*--- [2]*	*15 µg/L*	*--- [2]*	*15 µg/L*	*ARAR/TBC-Based PRG*	*15 µg/L*
Benzo(a) pyrene	*<0.06 µg/L*	*--- [2]*	*0.025 µg/L*	*--- [2]*	*0.2 µg/L*	*ARAR/TBC-Based PRG*	*0.2 µg/L*

Note:
[1] Background for surface soil is based on 95UCL on the mean for the background DU16. See Section 5.2.4 for a discussion of background for soil. Background for water is based on groundwater from locations G02 and G03.
[2] The risk assessment did not identify this chemical as a COC for this receptor.
[3] USEPA residential RSL based on a target cancer risk of 1E-06 and target HQ of 1. For some metals, the CalEPA residential screening levels are lower than the USEPA values.
[4] Lead is regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For lead, the action level is 15 µg/L.

ES 6. Identification and Analysis of Removal Action Alternatives

The removal action alternatives that were identified as potentially feasible alternatives that could meet the RAOs are listed below:

1. No Action
2. In-Place Containment of Contaminated Soils and In Situ Treatment of Groundwater with Monitored Natural Attenuation (MNA)
3. In-Place Containment of Contaminated Soils with Limited Excavation and Off-Site Disposal and In Situ Treatment of Groundwater with MNA
4. Excavation and Off-Site Disposal of Contaminated Soils with Limited In-Place Containment and In Situ Treatment of Groundwater with MNA
5. Excavation and Off-Site Disposal of Contaminated Soils and In Situ Treatment of Groundwater with MNA

Consistent with the NCP, a No Action alternative is considered to provide an environmental baseline against which impacts of the other alternatives can be compared.

ES 7. Comparative Analysis of Removal Action Alternatives

Text Table ES 7 summarizes the results of the evaluation of the criterion effectiveness, implementability, and cost for each alternative.

Text Table ES 7 Comparison of Alternatives

Criterion		Effectiveness						Implementability					Cost
Alternative		Protective of		Complies with ARARs?	Long Term	Reduction of Toxicity, Mobility, or Volume	Short Term	Feasibility			Acceptance		Present Value Cost
		Human Health?	The Environment?					Technical	Administrative	Availability of Services and Materials	State	Community	
1	No action	*Acceptable*	*Unacceptable*	*None*	*None*	*None*	*None*	*None*	*None*	*None*	*NE*	*NE*	*$0*
2	In-Place Containment of Contaminated Soils and In Situ Treatment of Groundwater with MNA	*Acceptable*	*Acceptable*	*Acceptable*	*Moderate*	*Low to Moderate*	*Moderate to High*	*Moderate to High*	*Moderate*	*Moderate to High*	*NE*	*NE*	*$2,350,000*
3	In-Place Containment of Contaminated Soils with Limited Excavation and Off-Site Disposal and In Situ Treatment of Groundwater with MNA	*Acceptable*	*Acceptable*	*Acceptable*	*Moderate*	*Low to Moderate*	*Moderate*	*Moderate to High*	*Low to Moderate*	*Moderate to High*	*NE*	*NE*	*$3,930,000*
4	Excavation and Off-Site Disposal of Contaminated Soils with Limited In-Place Containment and In Situ Treatment of Groundwater with MNA	*Acceptable*	*Acceptable*	*Acceptable*	*Moderate to High*	*Moderate*	*Moderate*	*Moderate*	*Low to Moderate*	*Moderate to High*	*NE*	*NE*	*$5,660,000*
5	Excavation and Off-Site Disposal of Contaminated Soils and In Situ Treatment of Groundwater with MNA	*Acceptable*	*Acceptable*	*Acceptable*	*High*	*Moderate to High*	*Low to Moderate*	*Moderate*	*Low to Moderate*	*Moderate to High*	*NE*	*NE*	*$7,130,000*

Notes

1. Detailed cost spreadsheets (cost summaries, present value analyses, and cost worksheets) for each alternative are presented in Appendix F.
2. Costs are based on a 10-year period of analysis.

Legend for Qualitative Ratings System:

Effectiveness and Implementability

For First Three Criteria

None

Unacceptable

Acceptable

For Rest of the Criteria

None

Low

Low to Moderate

Moderate

Moderate to High

High

NE (Not Evaluated)

ES 8. Recommended Removal Action Alternative

The NPS will make the determination of the recommended removal alternative prior to finalizing the EE/CA. The determination of the recommended alternative will be based on the results comparative analysis of removal alternatives in conjunction with consideration of state and community acceptance.

Once the EE/CA is finalized, it will be presented to the public. For NTCRAs, the NCP requires a 30-day public comment period on the EE/CA and any supporting documentation (including fact sheets or other documents summarizing the alternatives under consideration). After the public comment period is over, a written response to significant comments received during the comment period is prepared. The response to comments should be included in the administrative record file.

The final phase of the NTCRA selection process is to prepare the Action Memorandum. The Action Memorandum, as a primary decision document, substantiates the need for removal action, identifies the proposed action, and explains the rationale for the removal action alternative selected.