M60050.002215
MCAS EL TORO
SSIC # 5090.3

Bechtel

401 West A Street
Suite 1000
San Diego, CA 92101-7905

CLEAN II Program
Bechtel Job No. 22214
Contract No. N68711-92-D-4670
File Code: 0214
IN REPLY REFERENCE: CTO-0079/0424

June 2, 1998

Contracting Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Selby, Code 57CS1.RS
Building 127, Room 112
1220 Pacific Highway
San Diego, CA 92132-5190

Subject: Replacement Pages for the Draft Final Phase II Feasibility Study OU-3A Sites, Marine Corps Air Station, El Toro, California

Dear Mr. Selby:

It is our pleasure to submit these replacement pages for the Draft Final Phase II Feasibility Study Report for Operable Unit 3A Sites, MCAS El Toro, California, prepared under Contract Task Order (CTO) 0079 and Contract No. N68711-92-D-4670. Please place the enclosed pages in the document and remove the original corresponding pages. We gratefully acknowledge the high level of cooperation and team work demonstrated by personnel from MCAS El Toro, Southwest Division, the United States Environmental Protection Agency, California Department of Toxic Substances Control, and Regional Water Quality Control Board - Santa Ana Region, during the execution of this project.

We appreciate the opportunity to be of service to you on this project. If you have any questions or would like further information, please contact me at (619) 687-8780.

Sincerely,

Dante J. Tedaldi, Ph.D., P.E.
Project Manager

DJT/sp

Enclosure: Replacement Pages for the Draft Final Phase II Feasibility Study OU-3A Sites

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DRAFT FINAL PHASE II FEASIBILITY STUDY OU-3A SITES DATED JANUARY 1998 ENTERED IN DATABASE AND FILED AS ADMINISTRATIVE RECORD NO. M60050.002069

BECHTEL NATIONAL INC.

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Contract No. N-68711-92-D-4670 **Document Control No.:** CTO-0079/0424

File Code: 0214

TO: Contracting Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Selby, Code 57CS1.RS
Building 127, Room 112
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: June 2, 1998
CTO #: 079
LOCATION: MCAS El Toro

FROM: [signature]
D. J. Tedaldi, Ph.D., P.E., Project Manager

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Table ES-5
Alternative Cost and Schedule Comparison for Site 12, Unit 3

Alternative	Capital Cost[a] (thousands of dollars)	Remedial Construction Duration (months)	Monitoring and Maintenance Period (years)	Net Present Worth[b] (thousands of dollars)
1	—[c]	—	—	—
2	335	3	30	350.1
3	739.4	3	30	739.4
4	7,389.8 [d]	6[e]	30	7,389.8[d]
5	2,707.3[d]	5[e]	30	2,707.3[d]

Notes:
[a] capital cost includes direct costs, indirect costs, escalation (from base year of 1995 to midpoint of construction in 1999), and 20 percent contingency
[b] net present worth equal to capital cost plus monitoring and maintenance costs where applicable
[c] —– not applicable
[d] cost based on the treatment being performed at Site 8 in conjunction with similar remedial action there
[e] remedial construction duration based on the treatment being performed at Site 8 in conjunction with similar remedial action there

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thermal desorption. These are both *ex situ* treatment processes. Soil washing and incineration, also both *ex situ* treatment processes, are applicable to all three types of contaminants.

Bioventing and low-temperature thermal desorption are both effective treatment processes capable of reducing the concentration of PAHs reported in soil at Unit 5. Bioventing may also have limited treatment effectiveness for selected PCBs and pesticides, although they are not target contaminants. The advantage of bioventing is that the process directly reduces the toxicity of the PAHs, whereas the PAHs must still be treated or disposed after they are separated from the soil matrix using low-temperature thermal desorption. This is not considered a significant disadvantage, however, because permitted full-scale thermal desorption systems incorporate the necessary additional treatment equipment (typically thermal oxidation or an afterburner). Disadvantages of bioventing include the low moisture content of the soil and the time required to complete the remedial action. Low soil moisture content may limit the rate of aerobic biodegradation and consequently the overall effectiveness of bioventing. This is further compounded by the tendency of bioventing to dry out the soil. In addition, bioventing may require a year or more to successfully complete remediation. This extended cleanup period may prevent use of the treatment area during that time because the system layout utilizes an extensive network of piping and injection or extraction wells. In contrast, low soil moisture content is an advantage for thermal desorption, mobile treatment units are widely available, and the time required to complete cleanup would be 6 months or less. Based on these considerations, the recommended treatment process for soil containing PAHs is low-temperature thermal desorption.

Dehalogenation, high-temperature thermal desorption, and incineration are all effective treatment processes for PCB- and pesticide-contaminated soil. In addition, high-temperature thermal desorption and incineration also have limited treatment effectiveness for PAHs. Only dehalogenation and incineration actually reduce toxicity by destroying the PCBs. Additional PCB treatment or disposal is required after they are separated from the soil matrix using high-temperature thermal desorption. In addition, dehalogenation and incineration are the only processes that can successfully reduce the PCB concentrations reported in soil at Units 1 through 4. Incineration is an established technology; dehalogenation is classified as a demonstration technology. There are three primary disadvantages of dehalogenation: the multiple treatment cycles that may be required to achieve the contaminant remediation goal, the resultant time required to complete remediation, and the cost. Costs for dehalogenation, which range from approximately $300 to over $600 per ton of soil, are affected by such factors as the contaminant concentrations, the number of treatment cycles necessary, the treatment chemicals required, the soil moisture and clay content, particle size heterogeneity, and secondary treatment residuals. The primary disadvantages of incineration are the cost, which can range from approximately $300 to $1,000 per ton of soil, and the potential need for off-Station disposal of the incineration residuals, which are likely to be hazardous due to the presence of metals concentrated in the incinerator ash. Of the three processes identified here, incineration is the recommended option for development of remedial alternatives involving treatment of PCB-contaminated soil at Site 8 for several reasons: it is the most effective process option for reducing the concentration of PCBs in soil, it is an established technology, and the time required to complete the remedial action would be 6 months or less.

Soil washing is also recommended as a treatment process for development of remedial alternatives in Section A3 of this attachment, but only as part of an alternative that includes other treatment or disposal process options. Because soil washing is a volume-reduction process, the primary advantage of its use at Site 8 is to minimize the volume of contaminated soil requiring treatment or disposal using more costly process options (i.e., incineration, dehalogenation, or off-Station Class I disposal facility). The cost of soil washing is estimated to range from about $100 to $300 per ton.

Cost ranges provided for the treatment process options are for screening purposes only and represent a range obtained from one or more sources. The factors controlling costs can include: contaminant concentrations; treatment chemicals required; soil moisture content; clay content; particle size heterogeneity; secondary treatment of residuals; fuel; electricity; water usage; and community acceptability.

A2.4.2.5 DISPOSAL

The disposal option identified for Site 8 consists of placing contaminated soil in an off-Station, RCRA-permitted, Class I disposal facility (Table A2-3). Although contaminated soil at Site 8 would not be classified as a hazardous waste, disposal at an off-Station Class I facility was the only disposal process option that passed the preliminary screening process described in Section 2.4.2 in the main body of this report. Provision for off-Station disposal at an RCRA-permitted Class I disposal facility is also applicable if the selected remedial alternative for Site 8 included treatment processes that concentrated the contaminants (e.g., soil washing) or generated hazardous residuals during treatment (e.g., incineration). Although the contaminated soil in place at Site 8 is not hazardous, soil washing would concentrate the contaminants into a smaller soil fraction that potentially could be classified as hazardous waste. In addition, the residuals remaining after incineration of contaminated soil would probably require disposal in a Class I facility due to the presence of metals concentrated in the incinerator ash.

The cost associated with this disposal option is estimated to range from about $50 to $200 per ton. Factors affecting the cost include the types of contaminants and the contaminant concentrations, distance from the site to the disposal facility, actual cost of disposal, and community acceptability. The closest off-Station disposal facility is the Class I landfill located in Imperial County near Westmoreland, California. This option is recommended for inclusion in the alternatives development process to address the need for off-Station hazardous and nonhazardous waste disposal.

A2.4.2.6 RECYCLING

The recycling option applicable to soil from Site 8 involves reusing the soil as cover material at one of the on-Station landfills (Table A2-3). Recycling of the excavated soil as cover material at the on-Station landfills appears to be feasible under regulations currently being promulgated by Cal-EPA for "recyclable materials used in a manner constituting disposal." Although confirmation sampling of the excavated soil would be necessary before it could be reused in either of the landfills, review of the RI data suggests that the soil should satisfy all of the federal and state requirements governing "use constituting disposal."

Recycling of Site 8 soil at Site 2 (Magazine Road Landfill) and/or Site 17 (Communication Station Landfill) could also be a beneficial reuse if a capping remedy is chosen for closure of these landfills, because cover material would be required to implement this remedy. Recycling of the soil from Site 8 would reduce the volume of imported cover material necessary if the presumptive remedy is implemented at the two landfills. Recycling is also expected to be very cost-effective because loading of soil and on-Station hauling from Site 8 to Sites 2 or 17 would be the primary cost components. Recycling is recommended for inclusion in the alternatives development process to provide the option for beneficial on-Station reuse of the contaminated soil.

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Table B2-4
Comparison of Treatment Technology Process Options at Units 1 and 2

Treatment Technologies	Preliminary Screening				Cost		Technology								Acceptability	
SOIL	Site Contaminants Treatable (Effectiveness)	Technology Applicable to Site (Implementability)	Technology Commercially Available (Cost)	Preliminary Evaluation	Overall Cost	Capital or O&M Intensive	Residuals Produced	Minimum Contaminant Concentration Achievable	Additional Technology Necessary	Addresses Toxicity, Mobility, or Volume	Provides Long-Term Effectiveness	Time to Complete Cleanup	System Reliability/Maintainability	Awareness of Consulting Community	Regulatory Acceptability	Community Acceptability
In Situ Technology				C,DNC		C,N,O&M	S,L,G,N			T,M,V						
Bioventing	No			DNC												
Ex Situ Technology																
Soil Washing	Yes(1,2)	Yes	Yes	C	⊙	BOTH	S, L	⊙	○	V	Yes	●	⊙	⊙	⊙	●
Dehalogenation	Yes(1,2)	Yes	Yes	C	○	BOTH	L	●	●	T	Yes	○	○	⊙	⊙	⊙
Low-Temperature Thermal Desorption	No			DNC												
High-Temperature Thermal Desorption	Yes(1,2)	Yes	Yes	C	⊙	BOTH	L	●	○	V	Yes	●	⊙	●	⊙	⊙
Incineration	Yes(1,2)	Yes	Yes	C	○	BOTH	L, S	●	●	T	Yes	●	⊙	●	⊙	○

Key	
Yes(1,2)	1 = PCBs, 2 = pesticides
C, DNC	C = Continue evaluating the technology (if all previous questions were answered yes), DNC = Do not continue (if at least one question was answered no)
C, N, O&M	C = Capital intensive, N = Neither, O&M = Operation and maintenance Intensive
S, L, G, N	S = Solid, L = Liquid, G = Gas, N = None
T, M, V	T = Toxicity, M = Mobility, V = Volume

	● Better	⊙ Average	○ Worse
Overall Cost	Cost for treatment is < $100/ton	Cost for treatment is > $100 and < $300/ton	Cost for treatment is > $300/ton
Minimum Contaminant Concentration Achievable	Treatment reduces contaminant concentrations to < 5 mg/kg	Treatment reduces contaminant concentrations to > 5 mg/kg and < 50 mg/kg	Treatment reduces contaminant concentrations to > 50 mg/kg
Additional Technology Necessary	No addition technology necessary after use of this technology	Not applicable	Additional treatment is necessary after use of this technology
Time to Complete Cleanup	< 1 year for *in situ* technologies, < 0.5 years for *ex situ* technologies	> 1 to < 3 years for *in situ* technologies, < 0.5 to 1 year for *ex situ* technologies	> 3 years for *in situ* technologies, > 1 year for *ex situ* technologies
System Reliability/Maintainability	High reliability and low maintenance	Average reliability and average maintenance	Low reliability and high maintenance
Awareness of Consulting Community	Generally known, information readily available in technical literature	Moderately known, some information available in technical literature	Generally unknown, little information available in technical literature
Regulatory Acceptability	Above-average acceptance	Average acceptance	Below-average acceptance
Community Acceptability	Minimal opposition from community likely	Public involvement occurs, but the technology is generally accepted	Serious public involvement occurs and the outcome is uncertain

The primary disadvantages of dehalogenation are the multiple treatment cycles that may be required to achieve the contaminant remediation goal, the resultant time required to complete remediation, and the cost. Costs for dehalogenation, which range from approximately $300 to $600 per ton of soil, are affected by such factors as the contaminant concentrations, the number of treatment cycles necessary, the treatment chemicals required, the soil moisture and clay content, particle size heterogeneity, and secondary treatment residuals. The primary disadvantages of incineration are the cost, which can range from approximately $300 to $1,000 per ton of soil, and the potential need for off-Station disposal of the incineration residuals, which may be hazardous due to the presence of concentrated metals in the ash.

Of the three processes identified here, incineration is the recommended option for development of remedial alternatives involving treatment of PCB-contaminated soil at Site 11 because it is the most effective process option for reducing the concentration of PCBs in soil; it is an established technology; and the time required to complete the remedial action would be 6 months or less. However, due to the volume of soil to be treated at Site 11, incineration (or any of the other treatment technologies) would only be feasible and cost-effective to implement if the soil from Site 11 were treated in conjunction with similar remedial action at Site 8.

Soil washing is also recommended as a treatment process for development of remedial alternatives in Section B3 of this attachment, but only as part of an alternative that includes other treatment or disposal process options. Because soil washing is a volume-reduction process, the primary advantage of its use at Site 11 is to minimize the volume of contaminated soil requiring treatment or disposal using more costly process options (i.e., incineration, dehalogenation, or disposal at a permitted off-Station Class I facility). The cost of soil washing is estimated to range from about $100 to $300 per ton. Like incineration (discussed above), soil washing would only be feasible and cost-effective to implement if the soil from Site 11 were treated in conjunction with similar remedial action at Site 8.

Cost ranges provided for the treatment process options are for screening purposes only and represent a range obtained from one or more sources. The factors controlling costs can include: contaminant concentrations; treatment chemicals required; soil moisture content; clay content; particle size heterogeneity; secondary treatment of residuals; fuel; electricity; water usage; and community acceptability.

B2.4.2.5 DISPOSAL

The disposal option identified for Site 11 is placing contaminated soil in an off-Station RCRA-permitted Class I disposal facility (Table B2-3). Although contaminated soil at Site 11 would not be classified as a hazardous waste, disposal at an off-Station Class I facility was the only disposal process option that passed the preliminary screening process described in Section 2.4.2 in the main body of this report.

Provision for off-Station disposal at an RCRA-permitted Class I disposal facility is applicable if the selected remedial alternative for Site 11 included treatment processes that concentrated the contaminants (e.g., soil washing) or generated hazardous residuals during treatment (e.g., incineration). Although the contaminated soil in place at Site 11 is not hazardous, soil washing would concentrate the contaminants into a smaller soil fraction that could potentially be classified as hazardous waste. In addition, any incineration residuals would likely require disposal in a Class I facility due to the presence of concentrated metals in the ash.

The cost associated with this disposal option is estimated to range from about $50 to $200 per ton. Factors affecting the cost include the types of contaminants and the contaminant concentrations, the distance from the site to the disposal facility utilized, the actual cost of disposal, and community acceptability. The closest off-Station disposal facility is the Class I landfill located in Imperial County near Westmoreland, California. This disposal option is recommended for inclusion in the alternatives development process to cover disposal requirements for hazardous and nonhazardous wastes.

B2.4.2.6 RECYCLING

The recycling option applicable to soil from Site 11 involves reusing the soil as cover material at one of the on-Station landfills (Table A2-3). Recycling of the excavated soil as cover material at the on-Station landfills appears to be feasible under regulations currently being promulgated by Cal-EPA for "recyclable materials used in a manner constituting disposal." Although confirmation sampling of the excavated soil would be necessary before it could be reused in either of the landfills, review of the RI data suggests that the soil should satisfy all of the federal and state requirements governing "use constituting disposal." Recycling of Site 11 soil as cover material at the Sites 2 and/or 17 landfills could be a beneficial reuse because it would reduce the volume of imported material brought in to prepare the landfill surface for capping if this presumptive remedy is implemented at the two landfills. Recycling is also cost-effective because no landfill disposal fees would be incurred, and transportation would be the major cost component. The hauling distance from Site 11 would be approximately 4.1 miles each way, traveling entirely on Station, rather than public, roadways.

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381-foot-long upper reach between South Marine Way and Plant Road and an 846-foot-long lower reach extending from Plant Road to Bee Canyon Wash. The upper and lower reaches would be connected using an existing catch basin and 65-foot-long culvert that passes beneath Plant Road. The drainage system would also incorporate two inlet structures along the upper reach and three inlet structures along the lower reach to handle surface runoff from surrounding areas.

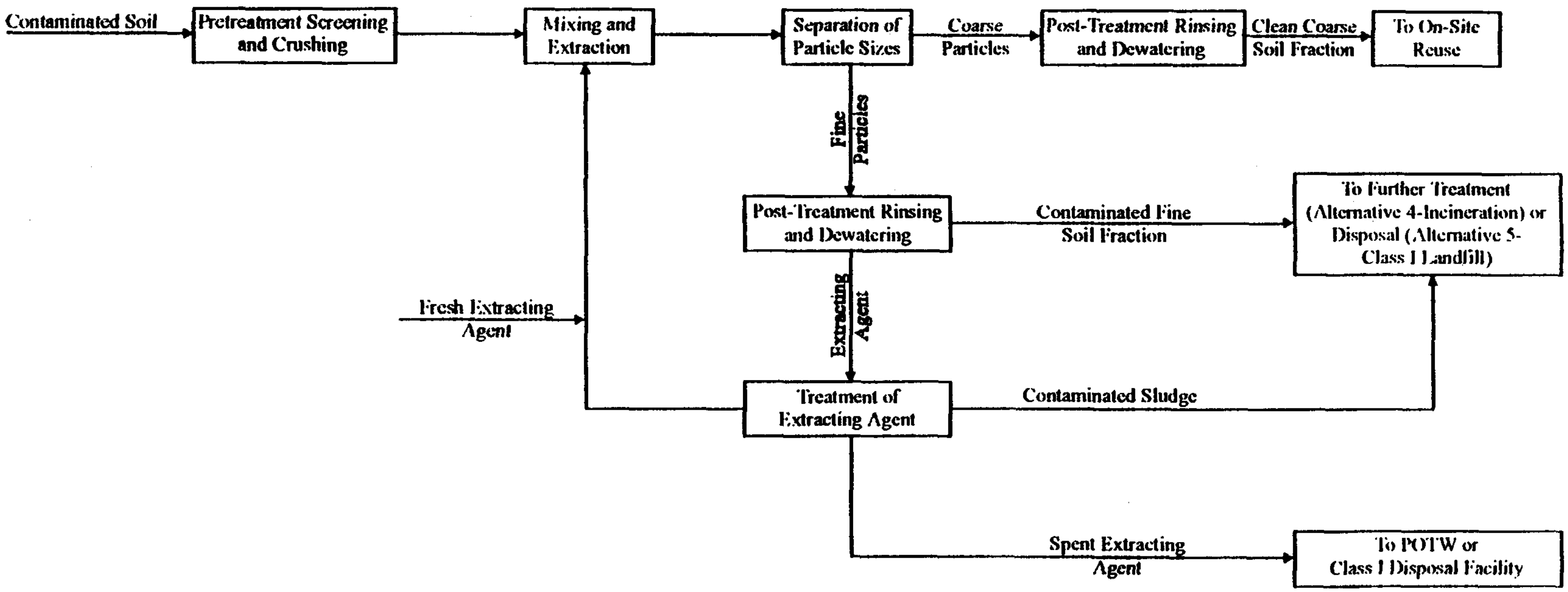
Following completion of the remedial activities described above, the area of Unit 3 would be seeded and fertilized to facilitate growth of grasses compatible with vegetation in the surrounding area.

C3.4 ALTERNATIVE 4 – EXCAVATION, ON-SITE SOIL WASHING, ON-SITE INCINERATION, AND OFF-STATION DISPOSAL OF INCINERATION RESIDUALS AT A CLASS I LANDFILL

Alternative 4 also addresses the collection/treatment GRA, and it combines removal, two treatment processes, and the disposal options (Figure C3-1). However, the estimated volume of soil that would be incinerated under this alternative at Unit 3 is insufficient to warrant on-site use of a mobile soil-washing system and a mobile incinerator. Therefore, development of this alternative assumes that remedial action at Unit 3 would be conducted concurrent with remedial action at Site 8 (Units 1 through 4), and the soil from Site 12 would be treated using soil-washing equipment and a mobile incinerator set up at Site 8. Site 8 is located about one-half mile east of Site 12.

Under this alternative, herbicide-, PAH-, PCB-, and pesticide-contaminated soil at the bottom of the drainage ditch throughout the upper reach would be excavated to a depth of approximately 3 feet bgs. Soil at the ditch bottom throughout the lower reach would be excavated to a depth of approximately 7 feet bgs. Specifics of the on-site excavation, embankment sloping, and confirmation sampling are the same as those described in Section C3.3 above.

The estimated volume of 7,705 lcy of excavated soil would be hauled to Site 8 and treated there using a soil-washing system (Figure C3-3) to separate the fine-grained soil fraction (containing the bulk of the contamination) from the coarser material, thereby reducing the volume of soil requiring further treatment. The treated coarser fraction (an estimated 5,010 cubic yards) generated by soil washing would be sampled to confirm that residual contaminant concentrations are less than the residential RBCs for the analytes reported in soil at Site 12. A total of ten samples (one sample per each 500 cubic yards of soil) would be submitted to a fixed-base laboratory for analysis of herbicides (U.S. EPA Method 8150), PCBs and pesticides (U.S. EPA Method 8080), SVOCs and PAHs (low detection-limit modification to U.S. EPA Method 8270), TAL metals (U.S. EPA CLP



OU-3A Feasibility Study Report

Figure C3-3

Soil Washing Process Schematic-Alternatives 4 and 5
Site 12, Unit 3

MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 12/23/97
File No: 079S2465
Job No: 22214-079
Rev No: B

Method), and VOCs (U.S. EPA Method 8010/8020). Immunoassay field screening for PCBs and PAHs is not proposed because such screening would not reduce the necessary fixed-base laboratory analyses. Upon receipt of the analytical results, the treated coarse soil fraction would be reused at Site 12 to partially backfill the excavated areas of Unit 3.

The finer soil fraction obtained from soil washing (an estimated 2,695 cubic yards) would be further treated using a mobile incinerator (Figure C3-4) set up at Site 8 to destroy the herbicides, PCBs, PAHs, pesticides, and other organic contaminants. Because incineration does not treat metals in the soil, the treatment residuals may be hazardous due to the presence of metals concentrated in the incinerator ash. The metals concentrated in the ash cannot be determined until a treatability study for the incinerator is conducted. The metals concentrated in the incinerator ash would consist of a subset of those identified in Unit 3 soil samples, which typically include sodium, potassium, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, mercury, and zinc. This residual material (an estimated 406 cubic yards) would be transported to an off-Station RCRA-permitted disposal facility, in this case the Class I landfill located in Imperial County near Westmoreland, California, approximately 200 miles from the Station.

Upon completion of the removal and treatment operations, the excavated areas at Site 12 would be backfilled to surrounding grade of the areas adjacent to Unit 3 using a combination of the treated coarse soil fraction from soil washing (5,010 lcy), supplemented with clean compacted fill material (5,170 lcy) obtained from an on-Station borrow area located between Sites 2 and 17, approximately 3.9 miles from Site 12. The backfill material obtained from the borrow area would be transported to Site 12 using on-Station roads. The estimated 10,180 cubic yards of material necessary to backfill Unit 3 represents the soil excavated under this alternative (estimated 7,705 cubic yards) and an additional 2,475 cubic yards of material needed to backfill the original ditch area to the surrounding grade. Because backfilling of the drainage ditch to surrounding grade would eliminate the existing surface runoff conveyance to Bee Canyon Wash, this alternative also includes provision for installation of a storm drainage system throughout Unit 3. Specifics of the storm drainage system to be installed along the ditch are the same as those described in Section C3.3 above.

Following completion of the remedial activities described above, the area of Unit 3 would be seeded and fertilized to facilitate growth of grasses compatible with vegetation in the surrounding area.

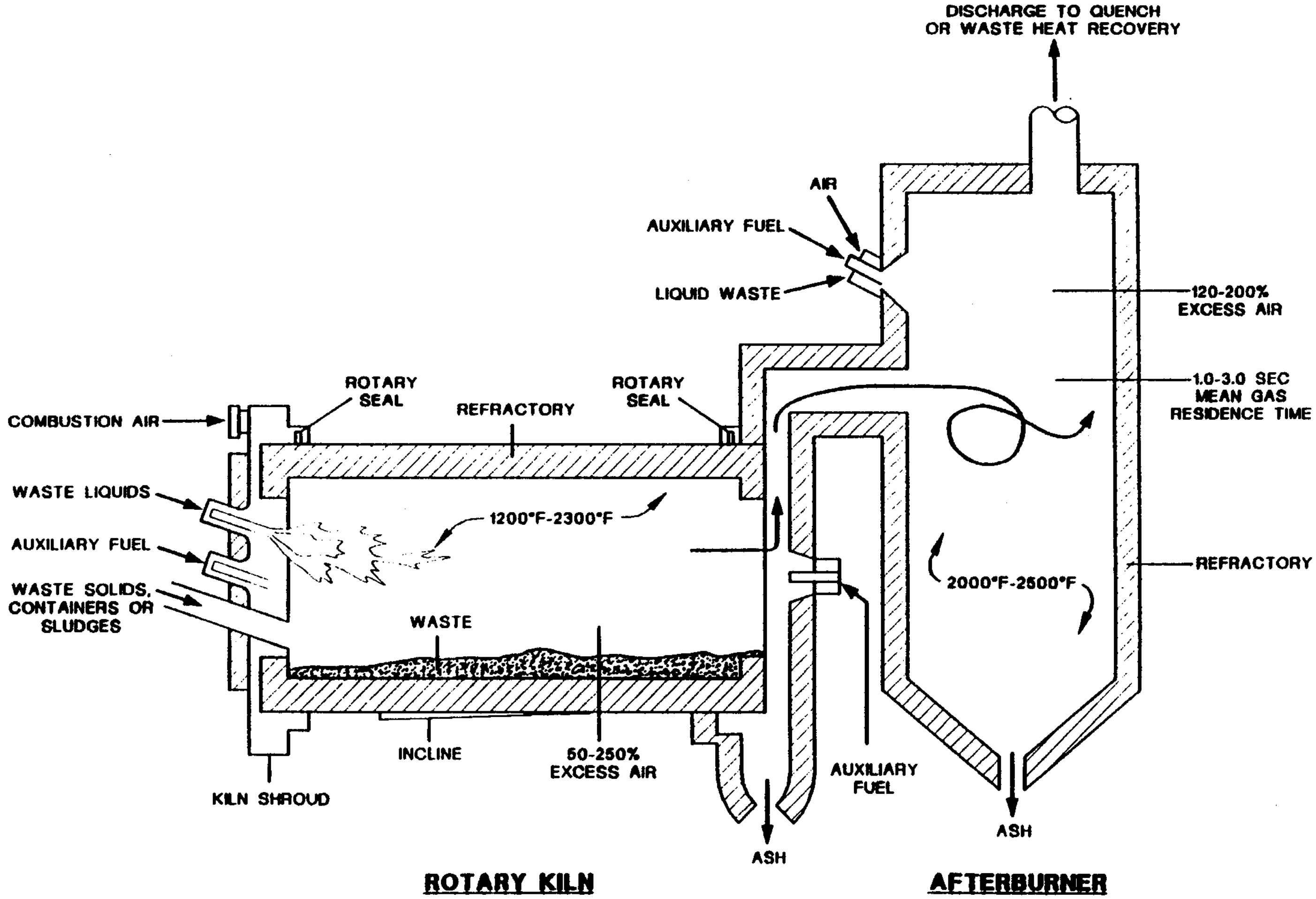


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Figure C3-4

Typical Rotary Kiln Incineration Process Schematic
Alternative 4 - Site 12, Unit 3

MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 12/12/97
File No: 079S2466
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C3.5 ALTERNATIVE 5 – EXCAVATION, ON-SITE SOIL WASHING, AND OFF-STATION DISPOSAL AT A CLASS I LANDFILL

Alternative 5 also addresses the collection/treatment GRA, and it combines removal, treatment, and disposal process options (Figure C3-1). Like Alternative 4, the estimated volume of soil that would be treated under this alternative at Unit 3 is insufficient to warrant on-site use of a mobile soil-washing system. Therefore, development of this alternative assumes that remedial action at Unit 3 would be conducted concurrent with remedial action at Site 8 (Units 1 through 4), and the soil from Site 12 would be treated using soil-washing equipment set up at Site 8. Site 8 is located about one-half mile east of Site 12.

Under this alternative, herbicide-, PAH-, PCB-, and pesticide-contaminated soil at the bottom of the drainage ditch throughout the upper reach would be excavated to a depth of approximately 3 feet bgs. Soil at the ditch bottom throughout the lower reach would be excavated to a depth of approximately 7 feet bgs. Specifics of the on-site excavation, embankment sloping, and confirmation sampling are the same as those described in Section C3.3 above.

The estimated loose volume of 7,705 cubic yards of excavated soil would be hauled to Site 8 and treated using a soil-washing system (Figure C3-3) to separate the fine-grained soil fraction (containing the bulk of the contamination) from the coarser material, thereby reducing the volume of soil requiring off-Station disposal. The treated coarser fraction (an estimated 5,010 cubic yards) generated by soil washing would be sampled to confirm that residual contaminant concentrations are less than the residential RBCs for the analytes reported in soil at Site 12. A total of ten samples (one sample per each 500 cubic yards of soil) would be submitted to a fixed-base laboratory for analysis of herbicides (U.S. EPA Method 8150), PCBs and pesticides (U.S. EPA Method 8080), SVOCs and PAHs (low detection-limit modification to U.S. EPA Method 8270), TAL metals (U.S. EPA CLP Method), and VOCs (U.S. EPA Method 8010/8020). Immunoassay field screening for PCBs and PAHs is not proposed because such screening would not reduce the necessary fixed-base laboratory analyses. Upon receipt of the analytical results, the treated coarse soil fraction would be reused at Site 12 to partially backfill the excavated areas of Unit 3.

The finer soil fraction (an estimated 2,695 cubic yards) would be transported to an off-Station RCRA-permitted disposal facility, in this case the Class I landfill located in Imperial County near Westmoreland, California, approximately 200 miles from the Station. Disposal of the herbicide-, PAH-, PCB-, and pesticide-contaminated soil fraction at a Class I facility is proposed for this alternative because the soil-washing process will concentrate contaminants into a smaller volume of material. This soil fraction would probably not be suitable for disposal at a Class III landfill due to the resultant increase in contaminant concentrations and the types of contaminants involved (particularly PAHs and PCBs).

Upon completion of the removal and treatment operations, the excavated areas at Site 12 would be backfilled to surrounding grade of the areas adjacent to Unit 3 using a combination of the treated coarse soil fraction from soil washing (5,010 lcy), supplemented with clean compacted fill material (5,170 lcy) obtained from an on-Station borrow area located between Sites 2 and 17, approximately 3.9 miles from Site 12. The backfill material obtained from the borrow area would be transported to Site 12 using on-Station roads. The estimated 10,180 cubic yards of material necessary to backfill Unit 3 represents the soil excavated under this alternative (estimated 7,705 cubic yards) and an additional 2,475 cubic yards of material needed to backfill the original ditch area to the surrounding grade. Because backfilling of the drainage ditch to surrounding grade would eliminate the existing surface runoff conveyance to Bee Canyon Wash, this alternative also includes provision for installation of a storm drainage system throughout Unit 3. Specifics of the storm drainage system to be installed along the ditch are the same as those described in Section C3.3 above. Following completion of the remedial activities described above, the area of Unit 3 would be seeded and fertilized to facilitate growth of grasses compatible with vegetation in the surrounding area.

C4.4.7 Cost

The cost estimate for Alternative 3 was generated using RACER. Table C4-2 presents estimated costs associated with the implementation of Alternative 3. The estimated costs presented in Table C4-2 have been adjusted to reflect an assumed remediation start date of January 1999. These costs include capital costs associated with implementation of this alternative and long-term O&M to maintain a grass cover over the soil backfill compatible with vegetation in surrounding areas. The capital costs include direct costs, indirect costs, escalation (from the RACER base cost year of 1995 to the midpoint of remediation in February 1999), and a 20 percent contingency. Direct costs cover excavation, loading, and hauling the contaminated soil to the on-Station landfills; installing the storm drainage system; loading, hauling, and placing clean backfill material at Unit 3; confirmation sampling and analysis following excavation; professional labor; and remedial design. Indirect costs include contractor overhead and profit. These estimated costs are intended solely for comparative purposes in this site-specific FS and should not be used for budgeting or planning purposes. Appendix III presents a more detailed discussion of the costs associated with Alternative 3. The estimated net present worth of Alternative 3 (as of January 1999) is $739,400.

C4.4.8 State Acceptance

The state has not yet commented on the acceptability of Alternative 3.

C4.4.9 Community Acceptance

Community acceptance of Alternative 3 will be assessed following the public review process.

C4.5 ALTERNATIVE 4 – EXCAVATION, ON-SITE SOIL WASHING, ON-SITE INCINERATION, AND OFF-STATION DISPOSAL OF INCINERATION RESIDUALS AT A CLASS I LANDFILL

Alternative 4 also employs the collection/treatment GRA, and it combines removal, two treatment processes, and disposal. Under this alternative, an estimated 6,165 bcy of contaminated soil would be excavated at Unit 3. The 7,605 lcy of excavated soil would be hauled to Site 8 and treated using an on-site soil-washing system to separate the fine-grained soil fraction (containing the bulk of the contamination) from the coarser material, thereby reducing the volume of soil requiring further treatment. The treated coarser fraction (an estimated 5,010 lcy) would be hauled back to Site 12 and reused to partially backfill the excavated areas. The finer soil fraction (an estimated 2,695 lcy) would be treated further at Site 8 using an on-site mobile incinerator to destroy the herbicides, PAHs, PCBs, pesticides, and other organic contaminants. Incinerator residual material

Table C4-2
Alternative 3 – Cost-Estimate Summary

Cost Category	Capital Costs
Direct Costs	
Excavating contaminated soil (6,165 bcy[a])	$ 52,500
Loading and hauling excavated soil to Sites 2 or 17 landfills (7,705 lcy[b])	15,600
Excavating clean backfill material at on-Station borrow area (6,165 bcy)	18,500
Loading and hauling clean soil backfill to Site 12 (7,705 lcy)	15,600
Storm drainage system (1,227 linear feet)	27,200
Cap Unit 3 (backfill original ditch area to surrounding grade – 1,980 bcy)	71,700
Sampling and analysis (39 soil samples)	86,400
Professional labor[c]	29,800
Remedial design	8,400
Subtotal Direct Costs	**325,700**
Indirect Costs[d]	222,800
Escalation[e]	67,700
Contingency[f]	123,200
Total Alternative 3[g] (~3-month construction period)	**$739,400**

Notes:
[a] bcy – bank cubic yards (in-place volume)
[b] lcy – loose cubic yards (excavated volume)
[c] professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database
[d] indirect costs include contractor indirect, overhead, and profit. These costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location specific considerations (local labor rates, taxes, etc., included in the RACER database)
[e] escalation modifies the costs in the RACER database from January 1995 to the midpoint of project remediation, assumed to be February 1999 for this alternative
[f] a 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects.
[g] costs reflect the net present worth as of January 1999

Excavation and treatment activities require significant technical and administrative efforts. Therefore, Alternative 5 would be difficult to implement.

C4.6.7 Cost

The cost estimate for Alternative 5 was developed using the RACER cost models for excavation, loading and hauling, soil washing, and disposal. Table C4-4 presents estimated costs associated with the implementation of Alternative 5. The estimated costs presented in Table C4-4 have been adjusted to reflect an assumed remediation start date of January 1999. These costs include capital costs associated with implementation of this alternative and long-term O&M to maintain a grass cover over the soil backfill compatible with vegetation in surrounding areas. The capital costs include direct costs, indirect costs, escalation (from the RACER base cost year of 1995 to the midpoint of remediation in March 1999), and a 20 percent contingency. Direct costs cover excavating, loading, and hauling the contaminated soil from Site 12 to the Site 8 treatment area; soil washing for the contaminated soil at Site 8; disposal of the contaminated fine soil fraction (from soil washing) at a permitted off-Station Class I disposal facility; loading and hauling the coarse treated soil back to Site 12 for reuse as backfill material; installing a storm drainage system; excavating, hauling, and placing clean backfill at Unit 3; confirmation sampling and analysis following excavation; professional labor; and remedial design. Indirect costs include contractor overhead and profit. These costs are intended solely for comparative purposes in this site-specific FS and should not be used for budgeting or planning purposes. Appendix III presents a more detailed discussion of the costs associated with Alternative 5. The estimated net present worth of Alternative 5 (as of January 1999) is $2,707,300.

C4.6.8 State Acceptance

The state has not yet commented on the acceptability of Alternative 5.

C4.6.9 Community Acceptance

Community acceptance of Alternative 5 will be assessed following the public review process.

Table C4-4
Alternative 5 – Cost-Estimate Summary

Cost Category	Capital Costs
Direct Costs	
Excavating contaminated soil (6,165 bcy[a])	$ 52,500
Loading and hauling excavated soil to Site 8 treatment area (7,705 lcy[b])	15,600
Soil washing at Site 8 treatment area (7,705 lcy)	589,500[c]
Transporting contaminated soil to off-Station Class I landfill (2,695 lcy)	98,500
Disposal at off-Station Class I landfill (2,695 lcy/3,383 tons)	278,300
Loading and hauling treated soil (soil washing) from Site 8 back to Site 12 (5,010 lcy)	10,600
Backfilling excavated areas at Unit 3 with treated soil (5,010 lcy)	12,800
Excavating clean backfill material on-Station borrow area (2,155 bcy)	11,300
Loading and hauling backfill material from borrow area to Site 12 (2,695 lcy)	9,900
Storm drainage system (1,227 linear feet)	27,200
Cap Unit 3 (backfill original ditch area to surrounding grade – 1,980 bcy)	71,700
Sampling and analysis (37 soil samples)	107,000
Professional labor[d]	67,600
Remedial Design	33,100
Subtotal Direct Costs	**1,385,600**
Indirect Costs[e]	615,500
Escalation[f]	255,000
Contingency[g]	451,200
Total Alternative 5[h] (~5-month construction period)	**$2,707,300**

Notes:
- [a] bcy – bank cubic yards (in-place volume)
- [b] lcy – loose cubic yards (loose volume)
- [c] cost based on assumption that treatment is conducted at Site 8 treatment area and is calculated as a percentage of Site 8 cost for this activity
- [d] professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database.
- [e] indirect costs include contractor indirect, overhead, and profit. These costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location-specific considerations (local labor rates, taxes, etc., included in the RACER database).
- [f] escalation modifies the costs in the RACER database from January 1995 to the midpoint of remediation, assumed to be March 1999 for this alternative
- [g] a 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects
- [h] costs reflect the net present worth as of January 1999

Table C5-2
Alternative Cost and Schedule Comparison for Unit 3

Alternative	Capital Cost[a] (thousands of dollars)	Remedial Construction Duration (months)	Monitoring and Maintenance Period (years)	Net Present Worth[b] (thousands of dollars)
1	—[c]	—	—	—
2	335	3	30	350.1
3	739.4	3	30	739.4
4	7,389.8[d]	6[e]	30	7,389.8[d]
5	2,707.3[d]	5[e]	30	2,707.3[d]

Notes:
[a] capital cost includes direct costs, indirect costs, escalation (from base year of 1995 to midpoint of construction in 1999), and 20 percent contingency
[b] net present worth equal to capital cost plus monitoring and maintenance costs where applicable
[c] —– not applicable
[d] cost based on the treatment being performed at Site 8 in conjunction with similar remedial action there
[e] remedial construction duration based on the treatment being performed at Site 8 in conjunction with similar remedial action there

C5.3 COMPLIANCE WITH ARARs

Alternatives proposed for remedial action at Unit 3 must meet the federal and state ARARs applicable or potentially applicable to the types of contaminants reported in soil and the technologies and process options selected to address the RAOs identified for Unit 3. Because the five alternatives use different combinations of technologies or process options to address the RAOs, the ARARs that must be met are specific to each alternative.

Alternative 1 would not comply with any ARARs because no remedial action would be taken to reduce the risks associated with contaminated soil at Unit 3.

Alternative 2 would comply with ARARs pertaining to air contaminants and particulate emissions and employee health and safety during construction of the monolithic soil cap with vegetative cover. The cap and associated storm drainage system would comply with ARARs pertaining to protection of groundwater by reducing the mobility of contaminants in shallow soil along the bottom of the drainage ditch. Alternative 2 would not comply with clean-closure ARARs.

Alternative 3 would comply with ARARs pertaining to the classification, generation, transportation, storage, and disposal of hazardous wastes; air contaminants and particulate emissions; and employee health and safety during the excavating, loading, and hauling contaminated soil from Unit 3. Because the contaminated soil would be physically removed from the site, Alternative 3 would also comply with ARARs pertaining to protection of groundwater and clean closure. Recycling excavated soil at the on-Station

Sites 2 and/or 17 landfills under Alternative 3 would also comply with the TBC requirements of the DTSC management memorandum pertaining to soil "used in a manner constituting disposal." Although not ARARs at this time, these requirements may become ARARs when the state promulgates formal regulations on this issue.

The excavation of contaminated soil under Alternative 4 would comply with the ARARs identified for Alternative 3. In addition, incineration of contaminated soil (from soil washing) under Alternative 4 would comply with ARARs pertaining to operation, air emissions, monitoring requirements, and closure of an incinerator, as well as the off-Station transportation of the incinerator residuals to a permitted Class I disposal facility. On-site reuse of the treated soil (from soil washing) would comply with clean-closure ARARs.

The excavation of contaminated soil under Alternative 5 would also comply with the ARARs identified for Alternative 3. This alternative would also comply with ARARs pertaining to the off-Station transportation of contaminated soil (from soil washing) to a permitted Class I disposal facility and clean-closure ARARs pertaining to on-site reuse of treated soil (from soil washing).

C5.4 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 1 would have very little long-term effectiveness because no remedial action would be conducted. Conditions at Unit 3 would remain unchanged from those now present at the site. Alternative 2 would have long-term effectiveness in preventing contact with the contaminated soil provided the cap is not disturbed. However, Alternative 2 is considered to be only moderately effective over the long-term because it does not represent a permanent solution. Alternatives 3, 4, and 5 offer high long-term effectiveness and are considered to be permanent solutions because the contaminants are removed from Site 12.

C5.5 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

This criterion focuses on the statutory preference for remedial actions that reduce the toxicity, mobility, or volume of contaminants using treatment technologies, either singularly or in combination (i.e., treatment train). Alternative 1 provides no appreciable reduction in contaminant toxicity, mobility, or volume because no remedial actions are taken; therefore, it is rated low. Similarly, Alternative 2 does not reduce contaminant toxicity, mobility, or volume through treatment; therefore, it is rated low.

Under Alternative 3, a significant reduction in the contaminant volume would be achieved because the contaminated soil would be excavated and physically removed from Site 12. Although the result of this alternative is volume reduction, it is not achieved through treatment; therefore, it is rated low.

Alternative 4 provides significant reductions in both contaminant volume and toxicity. A reduction in contaminant volume would be achieved through excavation of the associated with Alternatives 4 and 5 would require significant technical and administrative efforts. Therefore, Alternatives 4 and 5 are both rated low.

C5.8 COST

No cost is associated with Alternative 1. The estimated costs associated with the other four alternatives are presented in Table C5-2. These estimated costs range from $350,100 for Alternative 2 to $7,389,800 for Alternative 4. The magnitude of the estimated cost is directly related to the level of treatment and corresponding reduction in risk associated with each alternative.

C5.9 STATE ACCEPTANCE

The state has not commented on the acceptability of the five alternatives proposed for Unit 3.

C5.10 COMMUNITY ACCEPTANCE

Community acceptance of one or more of the five alternatives proposed for Unit 3 will be assessed following the public review process.

C5.11 SUMMARY OF COMPARATIVE ANALYSIS

The comparative analysis of alternatives highlights several issues that merit further consideration with regard to selection of an appropriate remedial alternative for shallow soil at Unit 3. These considerations focus on the interrelationship between three of the nine evaluation criteria: protection of human health and the environment, implementability, and cost. Alternatives that are more protective of human health and the environment or are more difficult to implement are also more costly. Alternatives that provide the greatest protection of human health and the environment are the most desirable. Alternative 1 provides essentially no protection of human health and the environment, is relatively easy to implement because no action is taken, and has no associated cost for those reasons. Alternative 2 had the lowest cost of the four remaining alternatives and requires only an average level of effort to implement, but it is only moderately protective of human health and the environment because the contaminated soil is simply covered by a cap rather than being removed and/or treated. Alternatives 3, 4, and 5 all provide the highest degree of protection of human health and the environment by removing and/or treating the contaminated soil, but the level of effort required to implement these alternatives and their associated costs varies considerably. Of these three, Alternative 3 requires the least level of effort to implement (average to slightly above average effort) and is only slightly more costly than Alternative 2.

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Table III2-3
Summary of Net Present Worth Cost for Remedial Action Alternatives for Site 11, Units 1 and 2

Remedial Action Alternative	Net Present Worth
1	No Costs
2	$58,800
3	$65,300
4	$355,300
5	$133,900

Table III2-4
Summary of Net Present Worth Cost for Remedial Action Alternatives for Site 12, Unit 3

Remedial Action Alternative	Net Present Worth
1	No Costs
2	$350,100
3	$739,400
4	$7,389,800
5	$2,707,300

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Section III4
ASSUMPTIONS

Assumptions for implementing the remedial alternatives that influence the costs were made on the basis of general engineering practices and the RACER 3.2 requirements, when appropriate. These assumptions were adhered to unless noted otherwise.

The following general assumptions were made in developing the cost estimates.

- Unless otherwise noted, materials used in cap construction are derived from locally available sources.
- Installation of capital equipment will be implemented in 1999, and the capital cost expenditure will be committed in January 1999.
- For Alternative 2 at Site 8 (Units 1 through 4), Site 8 (Unit 5), and Site 11 (Units 1 and 2), O&M costs will be incurred annually beginning at the end of the construction activities and continuing for a period of 30 years. These O&M costs will cover annual inspection of the asphalt cap and incremental repaving, equivalent over the 30-year maintenance period to a single complete replacement of the cap.
- For Alternative 2 at Site 12 (Unit 3), O&M costs (mowing, fertilizing, and reseeding of the vegetative cover) will be incurred annually beginning at the end of the construction activities and continuing for a period of 30 years.
- The site is generally accessible. Specialized equipment, outside of that anticipated, will not be required to complete the work.
- All earthwork operations and any postclosure maintenance activities will be conducted using safety Level D protective clothing.
- Contingencies are 20 percent of direct and indirect capital costs and escalation costs.
- Work plan preparation, health and safety plan, technical oversight during design and implementation of work, and reporting during any postclosure maintenance period are included in the cost for professional labor. Safety Level D was assumed for the professional labor/remedial action oversight cost estimates for all alternatives.

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contaminated soil at the bottom of the drainage ditch throughout the upper reach would be excavated to a depth of approximately 3 feet bgs; soil at the ditch bottom throughout the lower reach would be excavated to a depth of approximately 7 feet bgs. An estimated bank volume of 6,165 cubic yards of soil would be removed from Unit 3, yielding an estimated 7,705 lcy of soil. Once the upper and lower reaches of the ditch had been excavated to planned depth, soil sampling would be performed to confirm that all of the contaminated soil exceeding residential RBCs (for the analytes reported at Unit 3) had been removed. An estimated total of 23 soil samples would be collected from the bottom of the excavation and submitted to a fixed-base laboratory for analysis of herbicides (U.S. EPA Method 8150), PCBs and pesticides (U.S. EPA Method 8080), SVOCs and PAHs (low detection limit modification to U.S. EPA Method 8270), TAL metals (U.S. EPA CLP Method), and VOCs (U.S. EPA Method 8010/8020).

The estimated 7,705 cubic yards of excavated soil from Unit 3 would be recycled as cover material at the on-Station Site 2 and/or Site 17 landfills. Recycling of the Site 12 soil as cover material for the landfills is a beneficial use if a capping remedy is chosen, because cover material will be required to prepare the landfill surfaces for closure under this remedy.

Recycling of the excavated soil as cover material at the on-Station landfills appears to be feasible under the U.S. EPA provisions for materials "used in a manner constituting disposal" and similar regulations currently being promulgated by Cal-EPA. To satisfy the requirements under which recycling would be feasible, the soil would be stockpiled temporarily at Site 12 following excavation. Confirmation sampling of the stockpiled soil would be performed to document that analyte concentrations did not exceed TCLP, STLC, and TTLC regulatory levels. Based on the estimated volume of 7,705 cubic yards, a minimum of 16 samples (one sample per 500 cubic yards of soil) would be collected and analyzed for herbicides, PCBs and pesticides, SVOCs and PAHs, metals, and VOCs. Upon receipt of the analytical results, the soil would be hauled to one or both of the landfills, a distance of approximately 3.9 miles, using only on-Station roads.

Upon completion of the removal operations, the excavated areas would be backfilled to surrounding grade of the areas adjacent to Unit 3 using clean compacted fill material obtained from an on-Station borrow area located between Sites 2 and 17, approximately 3.9 miles from Site 12. The backfill material would be transported to Site 12 over on-Station roads. The estimated 10,180 lcy of material necessary to backfill Unit 3 represent the estimated 7,705 cubic yards of soil excavated under this alternative and an additional 2,475 cubic yards of material needed to backfill the original ditch area to the surrounding grade. Because backfilling of the drainage ditch to surrounding grade would eliminate the existing surface runoff conveyance to Bee Canyon Wash, this alternative also includes provision for installation of a storm drainage system throughout Unit 3.

This system would consist of 12-inch-nominal-diameter reinforced concrete drain pipe laid in sand bedding material along the entire length of the drainage ditch. The new drain pipe would connect to the existing stormwater system that discharges into the ditch where it begins near South Marine Way, and it would be installed during the backfilling operations to provide a consistent slope to the terminal point at Bee Canyon Wash. The drainage system would consist of two sections, an approximately 381-foot-long upper reach between South Marine Way and Plant Road and an 846-foot-long lower reach extending from Plant Road to Bee Canyon Wash. The upper and lower reaches would be connected using an existing catch basin and 65-foot-long culvert that passes beneath Plant Road. The drainage system would also incorporate two inlet structures along the upper reach and three inlet structures along the lower reach to handle surface runoff from surrounding areas.

Following completion of the remedial activities described above, the area of Unit 3 would be seeded and fertilized to facilitate growth of grasses compatible with vegetation in the surrounding area.

III5.4.4 Alternative 4 – Excavation, On-Site Soil Washing, On-Site Incineration, and Off-Station Disposal of Incineration Residuals at a Class I Landfill

Alternative 4 addresses the collection/treatment GRA, and it combines removal, two treatment processes, and the disposal options. However, the estimated volume of soil that would be incinerated under this alternative at Unit 3 is insufficient to warrant on-site use of a mobile soil-washing system and a mobile incinerator. Therefore, development of this alternative assumed that remedial action at Site 12 (Unit 3) would be conducted concurrent with remedial action at Site 8 (Units 1 through 4), and the soil from Site 12 would be treated using soil-washing equipment and a mobile incinerator set up at Site 8. Site 8 is located about 0.5 miles east of Site 12.

Under this alternative, herbicide-, PAH-, PCB-, and pesticide-contaminated soil at the bottom of the drainage ditch throughout the upper reach would be excavated to a depth of approximately 3 feet bgs; soil at the ditch bottom throughout the lower reach would be excavated to a depth of approximately 7 feet bgs. Specifics of the on-site excavation and confirmation sampling are the same as those described in Alternative 3.

The estimated loose volume of 7,705 cubic yards of excavated soil would be hauled to Site 8 and treated using a soil-washing system (Figure 3-3) to separate the fine-grained soil fraction (containing the bulk of the contamination) from the coarser material, thereby reducing the volume of soil requiring further treatment. The treated coarser fraction (an estimated 5,010 cubic yards) generated by soil washing would be sampled to confirm that residual contaminant concentrations were less than the residential RBCs for the analytes reported in soil at Site 12. A total of 10 samples (one sample per each 500 cubic yards of soil) would be submitted to a fixed-base laboratory for analysis of herbicides (U.S. EPA Method 8150), PCBs and pesticides (U.S. EPA Method 8080), SVOCs and PAHs (low detection limit modification to U.S. EPA Method 8270), TAL metals (U.S. EPA CLP Method), and VOCs (U.S. EPA Method 8010/8020). Upon receipt of the analytical results, the treated coarse soil fraction would be reused at Site 12 to partially backfill the excavated areas of Unit 3.

The finer soil fraction obtained from soil washing (an estimated 2,695 lcy) would be further treated using a mobile incinerator set up at Site 8 to destroy the herbicides, PCBs, PAHs, pesticides, and other organic contaminants. Because incineration does not treat metals in the soil, the treatment residuals may be hazardous due to the presence of metals concentrated in the incinerator ash. This residual material (an estimated 406 cubic yards) would be transported to an off-Station RCRA-permitted disposal facility, in this case the Class I landfill located in Imperial County near Westmoreland, California, approximately 200 miles from the area.

Upon completion of the removal and treatment operations, the excavated areas at Site 12 would be backfilled to the surrounding grade of the areas adjacent to Unit 3 using a combination of the treated coarse soil fraction from soil washing (5,010 lcy), supplemented with clean compacted fill material (5,170 lcy) obtained from an on-Station borrow area located between Sites 2 and 17, approximately 3.9 miles from Site 12. The backfill material obtained from the borrow area would be transported to Site 12 over on-Station roads. The estimated 10,180 cubic yards of material necessary to backfill Unit 3 represent the soil excavated under this alternative (estimated 7,705 cubic yards) and an additional 2,475 cubic yards of material needed to backfill the original ditch area to the surrounding grade. Because backfilling of the drainage ditch to surrounding grade would eliminate the existing surface runoff conveyance to Bee Canyon Wash, this alternative also includes provision for installation of a storm drainage system throughout Unit 3. Specifics of the storm drainage system to be installed along the ditch are the same as those for Alternative 3.

Following completion of the remedial activities described above, the area of Unit 3 would be seeded and fertilized to facilitate growth of grasses compatible with vegetation in the surrounding area.

III5.4.5 Alternative 5 – Excavation, On-Site Soil Washing, and Off-Station Disposal at a Class I Landfill

Alternative 5 addresses the collection/treatment GRA, and it combines removal, treatment, and disposal process options. Like Alternative 4, the estimated volume of soil that would be treated under this alternative at Unit 3 is insufficient to warrant on-site use of a mobile soil-washing system. Therefore, development of this alternative assumes that remedial action at Site 12 (Unit 3) would be conducted concurrent with remedial action at Site 8 (Units 1 through 4), and the soil from Site 12 would be treated using soil-washing equipment set up at Site 8. Site 8 is located about 0.5 miles east of Site 12.

Under this alternative, herbicide-, PAH-, PCB-, and pesticide-contaminated soil at the bottom of the drainage ditch throughout the upper reach would be excavated to a depth of approximately 3 feet bgs; soil at the ditch bottom throughout the lower reach would be excavated to a depth of approximately 7 feet bgs. Specifics of the on-site excavation and confirmation sampling are the same as those described for Alternative 3.

The estimated loose volume of 5,705 cubic yards of excavated soil would be hauled to Site 8 and treated using a soil-washing system to separate the fine-grained soil fraction (containing the bulk of the contamination) from the coarser material, thereby reducing the volume of soil requiring off-Station disposal. The treated coarser fraction (an estimated 5,010 cubic yards) generated by soil washing would be sampled to confirm that residual contaminant concentrations were less than the residential RBCs for the analytes reported in soil at Site 12. A total of ten samples (one sample per each 500 cubic yards of soil) would be submitted to a fixed-base laboratory for analysis of herbicides (U.S. EPA Method 8150), PCBs and pesticides (U.S. EPA Method 8080), SVOCs and PAHs (low detection-limit modification to U.S. EPA Method 8270), TAL metals (U.S. EPA CLP Method), and VOCs (U.S. EPA Method 8010/8020). Upon receipt of the analytical results, the treated coarse soil fraction would be reused at Site 12 to partially backfill the excavated areas of Unit 3.

The finer soil fraction (an estimated 2,695 lcy) would be transported to an off-Station RCRA-permitted disposal facility, in this case the Class I landfill located in Imperial County near Westmoreland, California, approximately 200 miles from the area. Disposal of the PAH- and PCB-contaminated soil fraction at a Class I facility is proposed for this alternative because the soil-washing process would concentrate contaminants into a smaller volume of material. This soil fraction would probably not be suitable for disposal at a Class III landfill due to the resultant increase in contaminant concentrations and the types of contaminants involved (particularly PAHs and PCBs).

Upon completion of the removal operations, the excavated areas at Site 12 would be backfilled to the surrounding grade of the areas adjacent to Unit 3 using a combination of the treated coarse-soil fraction from soil washing (5,010 lcy), supplemented with clean compacted fill material (5,170 lcy) obtained from an on-Station borrow area located between Sites 2 and 17, approximately 3.9 miles from Site 12. The backfill material obtained from the borrow area would be transported to Site 12 via on-Station roads. The estimated 10,180 cubic yards of material necessary to backfill Unit 3 represent the soil excavated under this alternative (estimated 7,705 cubic yards) and an additional 2,475 cubic yards of material needed to backfill the original ditch area to the surrounding grade. Because backfilling of the drainage ditch to surrounding grade would eliminate the existing surface runoff conveyance to Bee Canyon Wash, this alternative also includes provision for installation of a storm drainage system throughout Unit 3. Specifics of the storm drainage system to be installed along the ditch are the same as those described for Alternatives 3 and 4.

Following completion of the remedial activities described above, the area of Unit 3 would be seeded and fertilized to facilitate growth of grasses compatible with vegetation in the surrounding area.

III5.5 NET PRESENT WORTH OF ALTERNATIVES

A summary of the net present worth for all alternatives is provided in Tables III5-1 through III5-16. The net present worth values were calculated using an O&M period of

30 years, where applicable, and a discount rate of 7 percent. See Section III3.3 of this appendix for a discussion of the net present worth calculations.

Table III5-1
Cost Estimate for Site 8, Units 1 Through 4, Alternative 2:
Asphalt Cap Plus Restrictive Covenant (Net Present Value)

Description	Cost
DIRECT COSTS	
Clear and grub	not required
Capping (~1.37 acres)	$236,100
Fencing	not required
Sampling and analysis	not required
Professional labor[a] (project oversight)	$7,000
Remedial design	$15,400
Total Direct Cost	**$258,500**
INDIRECT COSTS	
Contractor's indirect, overhead, and profit[b]	$140,700
Total Indirect Cost	**$140,700**
OTHER COSTS	
Escalation[c] (January 1995 to midpoint of construction)	$44,400
Contingency[d] (~20 percent)	$88,700
Total Other Costs	**$133,100**
CAPITAL COST (as of January 1999, ~1-month construction period)	**$532,300**
O&M COSTS (expressed in present worth dollars)	
Cap maintenance[e] (for 30 years)	$213,000
Total O&M Costs (as of January 1999)	**$213,000**
TOTAL PRESENT VALUE (as of January 1999)	**$745,300**

Notes:
[a] Professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database.
[b] These indirect costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location-specific considerations (local labor rates, taxes, etc., included in the RACER database).
[c] Escalation modifies the costs in the RACER database from January 1995 to the midpoint of the project construction, assumed to be January 1999 for this alternative.
[d] A 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects.
[e] Maintenance activities would include annual inspections and incremental repaving as necessary to maintain the integrity of the asphalt cap. Over the 30-year maintenance period, the total incremental repaving requirements are assumed to be equivalent to a single complete replacement of the asphalt cap.

Table III5-13
Cost Estimate for Site 12, Unit 3, Alternative 2:
Monolithic Soil Cap with Vegetative Cover Plus Restrictive Covenant (Net Present Value)

Description	Cost
DIRECT COSTS	
Clear and grub	not required
Storm drainage system (upper reach, 381 lf[a])	$8,100
Storm drainage system (lower reach, 846 lf)	$19,100
Capping (~0.52 acres)	$71,700
Fencing	not required
Sampling and analysis	not required
Professional labor[b] (project oversight)	$14,000
Remedial design	$6,100
Total Direct Cost	**$119,000**
INDIRECT COSTS	
Contractor's indirect, overhead, and profit[c]	$129,600
Total Indirect Cost	**$129,600**
OTHER COSTS	
Escalation[d] (January 1995 to midpoint of construction)	$30,600
Contingency[e] (~20 percent)	$55,800
Total Other Costs	**$86,400**
CAPITAL COST (as of January 1999, ~3-month construction period)	**$335,000**
O&M COSTS (expressed in present worth dollars)	
Cap maintenance (mowing, fertilizing, and reseeding for 30 years)	$15,100
Total O&M Costs (as of January 1999)	**$15,100**
TOTAL PRESENT VALUE (as of January 1999)	**$350,100**

Notes:
[a] lf – linear feet
[b] Professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database.
[c] These indirect costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location-specific considerations (local labor rates, taxes, etc., included in the RACER database).
[d] Escalation modifies the costs in the RACER database from January 1995 to the midpoint of the project construction, assumed to be February 1999 for this alternative.
[e] A 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects.

Table III5-14
Cost Estimate for Site 12, Unit 3, Alternative 3:
Excavation and On-Station Recycling (Net Present Value)

Description	Cost
DIRECT COSTS	
Excavating contaminated soil (6,165 bcy[a])	$52,500
Loading and hauling excavated soil to on-Station Sites 2 and/or 17 landfills (7,705 lcy[b])	$15,600
Excavating clean backfill material at on-Station borrow area (6,165 bcy)	$18,500
Loading and hauling backfill material from borrow area to Site 12 (7,705 lcy)	$15,600
Storm drainage system (upper reach, 381 lf[c])	$8,100
Storm drainage system (lower reach, 846 lf)	$19,100
Cap (backfill original ditch area to surrounding grade – 1,980 bcy/2,475 lcy)	$71,700
Sampling and analysis (39 soil samples)	$86,400
Professional labor[d] (project oversight)	$29,800
Remedial design	$8,400
Total Direct Cost	**$325,700**
INDIRECT COSTS	
Contractor's indirect, overhead, and profit[e]	$222,800
Total Indirect Cost	**$222,800**
OTHER COSTS	
Escalation[f] (January 1995 to midpoint of construction)	$67,700
Contingency[g] (~20 percent)	$123,200
Total Other Costs	**$190,900**
CAPITAL COST (as of January 1999, ~3-month construction period)	**$739,400**
TOTAL PRESENT VALUE (as of January 1999)	**$739,400**

Notes:
- [a] bcy – bank cubic yards (in-place volume)
- [b] lcy – loose cubic yards (loose [excavated] volume)
- [c] lf – linear feet
- [d] Professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database.
- [e] These indirect costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location-specific considerations (local labor rates, taxes, etc., included in the RACER database).
- [f] Escalation modifies the costs in the RACER database from January 1995 to the midpoint of the project construction, assumed to be February 1999 for this alternative.
- [g] A 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects.

Table III5-15
Cost Estimate for Site 12, Unit 3, Alternative 4:
Excavation, Soil Washing, and Incineration (Net Present Value)

Description	Cost
DIRECT COSTS	
Excavating contaminated soil (6,165 bcy[a])	$52,500
Loading and hauling excavated soil to Site 8 treatment area (7,705 lcy[b])	$15,600
Soil washing at Site 8 treatment area (7,705 lcy)	$589,500[c]
On-site incineration at Site 8 treatment area (35% from soil washing – 2,695 lcy)	$2,744,200[c]
Transporting incinerator residuals to off-Station Class I landfill (406 lcy)	$14,800
Disposal at off-Station Class I landfill (406 lcy/508 tons)	$42,200
Loading and hauling treated soil from soil washing back to Site 12 (65% from soil washing – 5,010 lcy)	$10,600
Backfilling excavated areas with treated soil (5,010 lcy)	$12,800
Excavating clean backfill material at on-Station borrow area (2,155 bcy)	$11,300
Loading and hauling backfill material from borrow area to Site 12 (2,695 lcy)	$9,900
Storm drainage system (upper reach, 381 lf[d])	$8,100
Storm drainage system (lower reach, 846 lf)	$19,100
Cap (backfill original ditch area to surrounding grade – 1,980 bcy/2,475 lcy)	$71,700
Sampling and analysis (34 soil samples, 1 incineration residuals sample)	$108,500
Professional labor[e] (project oversight)	$131,600
Remedial design	$100,800
Total Direct Cost	**$3,943,200**
INDIRECT COSTS	
Contractor's indirect, overhead, and profit[f]	$1,506,800
Total Indirect Cost	**$1,506,800**
OTHER COSTS	
Escalation[g] (January 1995 to midpoint of construction)	$708,200
Contingency[h] (~20 percent)	$1,231,600
Total Other Costs	**$1,939,800**
CAPITAL COST (as of January 1999, ~6-month construction period)	**$7,389,800**
TOTAL PRESENT VALUE (as of January 1999)	**$7,389,800**

(table continues)

Table III5-15 (continued)

Notes:

[a] bcy – bank cubic yards (in-place volume)

[b] lcy – loose cubic yards (loose [excavated] volume)

[c] Cost based on assumption that treatment is conducted at Site 8 treatment area and is calculated as a percentage of Site 8 cost for this activity.

[d] lf – linear feet

[e] Professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database.

[f] These indirect costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location-specific considerations (local labor rates, taxes, etc., included in the RACER database).

[g] Escalation modifies the costs in the RACER database from January 1995 to the midpoint of the project construction, assumed to be February 1999 for this alternative.

[h] A 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects.

Table III5-16
Cost Estimate for Site 12, Unit 3, Alternative 5:
Excavation, Soil Washing, and Off-Station Disposal (Net Present Value)

Description	Cost
DIRECT COSTS	
Excavating contaminated soil (6,165 bcy[a])	$52,500
Loading and hauling excavated soil to Site 8 treatment area (7,705 lcy[b])	$15,600
Soil washing at Site 8 treatment area (7,705 lcy)	$589,500[c]
Transporting contaminated soil to off-Station Class I landfill (35% from soil washing – 2,695 lcy)	$98,500
Disposal at off-Station Class I landfill (2,695 lcy/3,383 tons)	$278,300
Loading and hauling treated soil from soil washing back to Site 12 (65% from soil washing – 5,010 lcy)	$10,600
Backfilling excavated areas with treated soil (5,010 lcy)	$12,800
Excavating clean backfill material at on-Station borrow area (2,155 bcy)	$11,300
Loading and hauling backfill material from borrow area to Site 12 (2,695 lcy)	$9,900
Storm drainage system (upper reach, 381 lf[d])	$8,100
Storm drainage system (lower reach, 846 lf)	$19,100
Cap (backfill original ditch area to surrounding grade – 1,980 bcy/2,475 lcy)	$71,700
Sampling and analysis (37 soil samples)	$107,000
Professional labor[e] (project oversight)	$67,600
Remedial design	$33,100
Total Direct Cost	**$1,385,600**
INDIRECT COSTS	
Contractor's indirect, overhead, and profit[f]	$615,500
Total Indirect Cost	**$615,500**
OTHER COSTS	
Escalation[g] (January 1995 to midpoint of construction)	$255,000
Contingency[h] (~20 percent)	$451,200
Total Other Costs	**$706,200**
CAPITAL COST (as of January 1999, ~5-month construction period)	**$2,707,300**
TOTAL PRESENT VALUE (as of January 1999)	**$2,707,300**

(table continues)

Table III5-16 (continued)

Notes:

[a] bcy – bank cubic yards (in-place volume)
[b] lcy – loose cubic yards (loose [excavated] volume)
[c] Cost based on assumption that treatment is conducted at Site 8 treatment area and is calculated as a percentage of Site 8 cost for this activity.
[d] lf – linear feet
[e] Professional labor costs are computed by an internal RACER cost model. The project duration, the project Occupational Safety and Health Administration (OSHA) safety level, complexity of the alternative, and location are factored into an internal estimate of hours which are converted to a cost based on local labor rates in the RACER database.
[f] These indirect costs are computed by an internal RACER cost model based on the project duration, the project OSHA safety level, complexity of the alternative, and location-specific considerations (local labor rates, taxes, etc., included in the RACER database).
[g] Escalation modifies the costs in the RACER database from January 1995 to the midpoint of the project construction, assumed to be February 1999 for this alternative.
[h] A 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects.