TABLE 4-1
CROSS REFERENCE OF FORMER OPERABLE UNITS, FORMER PARCELS, AND LOCATIONS IN RAP
Oakland Army Base, Oakland, California

Army Operable Unit (a)	Army Parcel Number (b)	Locations Identified in RAP (c)
• OU 1	4	• Benzidine at Former Used Oil Tank 21
	5	• Miscellaneous RMP Locations (d)
	6	• Miscellaneous RMP Locations (Army Reserve Parcel, excluded from RAP)
	7	• Miscellaneous RMP Locations (Army Reserve Parcel, excluded from RAP)
	9	• Former ORP/Building 1 Area
	10	• VOCs in Groundwater Near Building 99 • Building 99 • Debris Area Near Building 99 • Building 85
	11	• VOCs in Groundwater Near Buildings 808 and 823 • Building 812 • Building 823
	12	• VOCs in Groundwater at Eastern End of Building 807 • Potential Drum Drainage Area East of Buildings 805 and 806
	13	• Potential Drum Drainage Area East of Buildings 805 and 806
	14	• Miscellaneous RMP Locations
	15	• VOCs in Groundwater at Eastern End of Building 807
• OU 2	8	• Building 991 Area
• OU 3	16	• Benzene and MTBE in Groundwater Near Former USTs 11A/12A/13A
	17	• Miscellaneous RMP Locations
	18	• Miscellaneous RMP Locations (Army Reserve Parcel, excluded from RAP)
	19	• Miscellaneous RMP Locations
	20	• Miscellaneous RMP Locations
	21	• Miscellaneous RMP Locations
	22	• Miscellaneous RMP Locations
	23	• Former Motor Pool and Salvage Operations at Building 640
	24	• Miscellaneous RMP Locations
	25	• Miscellaneous RMP Locations
	26	• Miscellaneous RMP Locations (Maritime Street)
• OU 4	1	• Spit (Excluded from RAP)
	2	• Miscellaneous RMP Locations
	3	• Miscellaneous RMP Locations
• OU 7	12, 15	• VOCs in Groundwater at Eastern End of Building 807

TABLE 4-1
CROSS REFERENCE OF FORMER OPERABLE UNITS, FORMER PARCELS, AND LOCATIONS IN RAP
Oakland Army Base, Oakland, California

Notes:

(a) The Former Operable Unit ("OU") and Parcel designations developed by the Army are listed in this table. This RAP document has been prepared anticipating future development at the Gateway Development Area ("GDA") and the Port Development Area ("PDA"). Former OU and parcel designations are not carried through this document, and are not shown on RAP figures. OUs 5 and 6 are unused designations.

(b) The GDA includes all or portions of Parcels 1 through 13, and 26. The area outside of the GDA is the PDA, and includes all or part of Parcels 3, 5, 7, 8, and 10 through 26.

(c) Basewide issues span multiple areas and are not specifically included in this table. Basewide issues include Washracks, Sumps, Oil/Water Separators, and Miscellaneous Operations; Tanks; Historical Spills and Stains; Lead in Soil Around Buildings; Former PCB-Containing Transformers and Equipment Locations; Storm Drains and Sanitary Sewer Locations; and Railroad Tracks.

(d) The term "Miscellaneous RMP Locations" indicates no specific RAP sites but possible RMP locations as identified in the RAP are within the former parcel. Identified RMP locations and Basewide issues may be present on all former parcels.

TABLE 4-2
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS GROUPINGS
Oakland Army Base, Oakland, California

Group 1: Areas Requiring Removal of Existing Subsurface Structure
• Hydraulic lift in eastern courtyard of Building 1. The hydraulic lift has apparently not been removed.
• A washrack with drains is located near Building 70. The washrack has apparently not been removed.
• An oil/water separator located northeast of Building 5 was connected to a floor drain system for Building 5. The oil/water separator may not have been removed.
• Facility 98 is a washrack with a drain near Building 99. The washrack has not been removed. Soil samples collected near the washrack contained polycyclic aromatic hydrocarbons ("PAHs"), total petroleum hydrocarbons ("TPH"), acetone, and methylene chloride. Groundwater samples did not contain volatile organic compounds ("VOCs") or TPH.
• Building 843 was a vehicle washrack. The exact location of the washrack has not been identified in available documents, although it is generally located near former oil/water separators 8 and 9. There is no reported removal of the structure.
• Former Building 42 was a PX gas station with associated tanks 42A and 42B. Soil samples collected near the former building contained low concentrations of TPH, benzene, toluene, ethylbenzene, and xylenes ("BTEX") PAHs, methyl ethyl ketone, naphthalene, vinyl acetate, acetone, and methylene chloride. Groundwater samples contained low concentrations of TPH, BTEX, and chloroform.
• Former Building 41 was a washrack associated with the former PX gas station.
Group 2: Areas Requiring Additional Characterization
• Former Building T-166 was a boat shop.
• Former Building T-165 was a jitney repair shop.
• Former Building T-164 was a boom repair shelter.
• Former incinerator that included a concrete lined storage pit. Incinerator was situated near Buildings 141 and 145. Low concentrations of dioxin detected in soil samples collected near incinerator.
• Vehicle service garage in Building S-4 prior to 1979.
• Former paint shop located north of Building 99.
• Potential impacts to property from storage of pesticides and oil spill near off-site Building 1084.
• Former Building T-815 was a paint and solvent storage shed. No VOCs or TPH were detected in soil or groundwater samples collected near the former shed.
• The western-most bay of Building 806 was used to store hazardous materials, including chlorinated hydrocarbons, pesticides, insecticides, mercuric solutions, and flammable materials.
• Former Building 831 was a vehicle washrack. Although there is no documented removal of the structure, the structure is not apparent on later post maps.

TABLE 4-2
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS GROUPINGS
Oakland Army Base, Oakland, California

Group 2: Areas Requiring Additional Characterization
• Building 838 was an auto hobby shop and contained a solvent cleaning tank. A storm drain inlet apparently located inside the structure was used to discharge antifreeze and other fluids and was stained with oil.
• Former Building 838 was a vehicle washrack. Although there is no documented removal of the structure, the structure is not apparent on later post maps.
• Former Building 839 was a vehicle washrack. Although there is no documented removal of the structure, the structure is not apparent on later post maps.
• Building 738 contained photographic and ceramic shops. Chemicals used at Building 738 included oils and greases, paints, chlorinated hydrocarbons, solvents, inks, and inorganic chemicals. Methylene chloride and metals were detected in soil samples collected near the structure.
• Former Building 647 was a shop of unknown use.
• Building 645 was a shop of unknown use.
• Former Building 591 reportedly contained a battery maintenance shop and washrack. Elevated concentrations of metals were detected in shallow soil.
• Army reportedly mixed pesticides and herbicides south of Building 590. Pesticides detected in soil.
• Former Building 530 was an incinerator.
• Building 590 reportedly contained a pesticide/herbicide mixing facility inside the building. Building 590 also contained a heating plant with boilers, floor drains, sumps, a small backup fuel oil AST (50-gallons), a carpenter shop, and a sign shop (BASELINE, 2002).
• Former salvage yard with railroad tracks beneath existing Building 590 (BASELINE, 2002).
• Former Building 683 was an autocraft shop with a nearby grease rack (BASELINE, 2002).
Group 3: Areas Anticipated to Require Removal of Impacted Soil
• Building 169 was used as hazardous materials storage area. TPH, PAHs, metals, and VOCs are present in groundwater.
• Building 167 was used as hazardous materials storage area. TPH, PAHs, metals, and VOCs are present in groundwater.
• Temporary hazardous waste storage shed.
• An inactive grease trap as located near the Building 60. TPH and acetone were detected in soil. No chemicals were detected in groundwater.
• Former paint storage shed located north of Building 99.
• OWS-4 was removed in 1999. Visually impacted soil was excavated. Lead, TPH, PAHs, 1,4-dichlorobenzene, acetone, and tetrachloroethene ("PCE") remain in soil.

TABLE 4-2
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS GROUPINGS
Oakland Army Base, Oakland, California

Group 3: Areas Anticipated to Require Removal of Impacted Soil
• Former Building 992 was used for storage of waste oil and engine cleaning solvent (e.g., naphtha). Detectable concentrations of acetone, methylene chloride, PAHs, and TPH in soil.
• Building T-816 was a hazardous waste accumulation shed. TPH was detected in a soil sample collected near the former shed. No VOCs or TPH were detected in groundwater.
• Facility 815 was a washrack with waste oil sump, associated sand trap, and two associated 550-gal waste oil USTs (Tanks 7 and 8). The structures were removed and the area overexcavated in 1999. TPH, PAHs, and metals remain in soil. TPH, PAHs, VOCs, and metals were detected in groundwater.
• An oil water separator (OWS-2) was located near Facility 815, and was removed and overexcavated in 1999. Low concentrations of TPH, PAHs, and metals remain in soil.
• Building 813 was a former hazardous waste storage shed. VOCs and PAHs detected in soil sample collected near location of former shed.
• A flammable materials storage shed was located near Building 808. A soil sample collected near the shed (on a ground stain) contained benzene, PCE, and methylene chloride.
• Temporary hazardous waste storage shed near Building 807.
• Hydraulic lift #1 inside Building 828. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.
• Hydraulic lift #2 inside Building 828. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.
• Hydraulic lift #3 inside Building 828. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.
• Oil water separator-5 ("OWS-5") was located inside Building 828. Halogenated VOCs, metals, TPH, and PAHs remain soil and BTEX remains in groundwater around OWS-5.
• OWS-6 near Building 830 was removed in 1998. Residual PCE, TPH, and PAHs remain in soil.
• OWS-7 near Building 830 was removed in 1998. Residual PCE, TCE, BTEX, methylene chloride, cis-1,2-DCE, TPH, and PAHs remain in soil.
• An oil water separator was located inside Building 830. Residual TPH, metals, PAHs, and trichloroethene ("TCE") remain in soil and residual TPH remains in groundwater around the oil/water separator.
• Hydraulic lift #1 inside Building 830. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.
• Hydraulic lift #2 inside Building 830. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.

TABLE 4-2
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS GROUPINGS
Oakland Army Base, Oakland, California

Group 3: Areas Anticipated to Require Removal of Impacted Soil
• Hydraulic lift #3 inside Building 830. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.
• Hydraulic lift #4 inside Building 830. The lift was removed in 1999. TPH remains in soil and groundwater around the lift.
• A parts washing sink was located inside Building 830.
• A hazardous waste storage area is located north of Building 838. TPH detected in soil. No chemicals detected in groundwater.
• Building 832 was a gasoline station and contained a solvent cleaning tank for metal parts cleaning (BASELINE, 2002).
• Former Building 837 was a grease rack. TPH and PAHs detected in soil and TPH detected in groundwater.
• Building 835 was a lube oil storage shed. Residual TPH and PAHs remain in soil and residual TPH remains in groundwater near the lube oil storage building.
• OWS-8 near Building 843 was removed in 1998. Residual methylene chloride, TPH, and PAHs remain in soil.
• OWS-9 near Building 843 was removed in 1998. Residual methylene chloride, TPH, and PAHs remain in soil.
• Army used Building 840 as a former vehicle maintenance shop. Building contained a vehicle paint room and associated floor drain at the east end of the structure. Soil at Building 840 is impacted by lead deposited from paint booth exhaust. Soil gas samples collected near building contained carbon tetrachloride, chloroform, toluene, and xylenes. Low concentrations of methyl tertiary butyl ether ("MTBE"), toluene, 1,1,2,2-tetrachloroethane, and methylene chloride detected in groundwater.
• A boiler room and sump was located inside Building 793. Elevated concentrations of TPH detected in soil.
• Former Building 648 was an auto crafts shop that contained two hydraulic lifts and a grease rack. The structure was demolished and the hydraulic lifts removed in 1995. TPH impacted soil was excavated and residual TPH, PCBs, and methylene chloride remains in soil. PAHs, TPH, and DDT were detected in soil samples collected from borings for monitoring wells. TPH and PAHs were detected in groundwater.
• Residual lead and TPH in soil in vicinity of West Grand Avenue Viaduct project. Benzene detected in groundwater.
• Building 828 was a gasoline station and contained 3 hydraulic lifts.
• Building 830 was an auto hobby shop and contained a parts washing sink, an oil/water separator, and four hydraulic lifts. Low concentrations of TPH, PAHs, and metals (lead and zinc) detected in soil near a storm drain inlet near Building 830. Low concentrations of PCE, MTBE, BTEX, PAHs, and TPH detected in groundwater.

TABLE 4-2
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS GROUPINGS
Oakland Army Base, Oakland, California

Group 4: Areas With No Currently Identified Environmental Issues
• The northern portion of Building 90 was also used for photograph processing. Floor drain was observed in the structure. A soil sample collected adjacent to the storm drain outside the structure did not contain TPH or VOCs.
• Building 6 contained an incinerator for destroying classified documents.
• Two pesticides storage sheds located northwest of Building 840. Only minimal concentrations of pesticides detected in soil.
• A kitchen washrack was located inside Building 790.
• A grease trap was located inside Building 790.
• A kitchen washrack was located inside Building 792. No chemicals detected in soil or groundwater.
• A grease trap was located inside Building 792. No chemicals detected in soil or groundwater.
• A grease trap was located inside Building 794. No chemicals detected in soil or groundwater.
• A kitchen washrack with sump was located inside Building 794. No chemicals detected in soil or groundwater.
• A grease trap was located inside Building 794. No chemicals detected in soil or groundwater.
• Household incinerator inside housing unit 773.
• Household incinerator inside housing unit 774.
• Household incinerator inside housing unit 775.
• Former Building 682 was an indoor small-bore firing range. Metals, including arsenic and zinc, were detected in soil samples collected near the former structure.
• Building 90 may have been used as an armor-clad indoor firing range. One soil sample collected adjacent to a storm drain near Building 90 contained elevated lead concentrations.
• Former 26th Street overpass. Measurable concentrations of lead in soil.

TABLE 4-3
TANK GROUPINGS
Oakland Army Base, Oakland, California

Group 1: Tank Sites Potentially Requiring Removal of an Existing Tank	
• **UST-G**	One fuel oil underground storage tank ("UST"). The exact location of the tank has not been confirmed (BASELINE, 2002) and there is no documented removal of tank. No further action ("NFA") letter received from RWQCB.
• **UST-H**	One former 1,000-gal fuel oil UST. The exact location of the tank has not been confirmed (BASELINE, 2002) and there is no documented removal of tank. NFA letter received from RWQCB.
• **UST-I**	One former 1,000-gal fuel oil UST. The exact location of the tank has not been confirmed (BASELINE, 2002) and there is no documented removal of tank. NFA letter received from RWQCB.
• **UST-J**	One former fuel oil UST. The exact location of the tank has not been confirmed (BASELINE, 2002) and there is no documented removal of tank. NFA letter received from RWQCB.
• **UST-L**	One former 2,500-gal fuel oil UST. The exact location of the tank has not been confirmed (BASELINE, 2002) and there is no documented removal of tank. Residual petroleum hydrocarbons in soil. NFA letter received from RWQCB.
• **UST-651**	Heating oil tank associated with former Building 651. No documented removal of tank.
• **UST-652**	Heating oil tank associated with former Building 652. No documented removal of tank.
• **UST-660**	Heating oil tank associated with former Building 660. No documented removal of tank.
• **UST-671**	Heating oil tank associated with former Building 671. No documented removal of tank.
• **UST-672**	Heating oil tank associated with former Building 672. No documented removal of tank.
• **UST-673**	Heating oil tank associated with former Building 673. No documented removal of tank.
• **UST-677**	Heating oil tank associated with former Building 677. No documented removal of tank.
• **UST-678**	Heating oil tank associated with former Building 678. No documented removal of tank.
• **UST-679**	Heating oil tank associated with former Building 679. No documented removal of tank.
• **UST-681**	Heating oil tank associated with former Building 681. No documented removal of tank.
• **UST-682**	Heating oil tank associated with former Building 682 (BASELINE, 2002). No documented removal of tank.
• **UST-684**	Heating oil tank associated with former Building 684. No documented removal of tank.
• **UST-686**	Heating oil tank associated with former Building 686. No documented removal of tank.
• **UST-688**	Heating oil tank associated with former Building 688. No documented removal of tank.
• **UST-715**	Heating oil tank associated with former Building 715 (BASELINE, 2002). No documented removal of tank.
• **UST-742**	Heating oil tank associated with former Building 742 (BASELINE, 2002). No documented removal of tank.
• **UST-743**	Heating oil tank associated with former Building 743 (BASELINE, 2002). No documented removal of tank.

TABLE 4-3
TANK GROUPINGS
Oakland Army Base, Oakland, California

Group 2: Former Tank Sites Anticipated to Require Removal of Impacted Soil (a)	
--	Three former 250-gal waste oil aboveground storage tanks ("ASTs") removed in 1995. Locations of the tanks are unknown, but are possibly near Building 99. No soil or groundwater data are available. No NFA letter request has been made.
--	Five former 7,000-gallon fuel oil ASTs. Residual petroleum hydrocarbons in soil. NFA received from RWQCB.
--	Three 1,000-gal asphalt ASTs. Residual petroleum hydrocarbons in soil. NFA letter received from RWQCB.
• **AST-14**	One former 550-gal gasoline AST west of Building 14. Residual petroleum hydrocarbons in soil. NFA letter received from RWQCB.
• **AST-842**	One former 1,000-gal diesel AST-842. NFA letter received from City of Oakland Fire Department.
• **AST-HMA**	One former used oil AST with hazardous materials storage area.
• **UST-10**	One former 10,000-gal diesel UST. NFA letter received from RWQCB.
• **UST-14**	One former 550-gal waste oil UST. Residual petroleum hydrocarbons in soil. NFA letter requested.
• **UST-19**	One former 550-gal waste oil UST. Residual petroleum hydrocarbons in soil. NFA letter requested.
• **UST-1A**	One former 1000-gal diesel UST. Residual petroleum hydrocarbons in soil. NFA letter received from City of Oakland.
• **UST-2, 2A**	Two former 550-gal diesel USTs. Residual petroleum hydrocarbons in soil at both tanks. NFA letter received from RWQCB for Tank 2. NFA letter requested for Tank 2A.
• **UST-42A**	Former gasoline tank associated with PX gasoline station (Building 42)
• **UST-42B**	Former gasoline tank associated with PX gasoline station (Building 42)
• **UST-M**	One former 1000-gal gasoline UST (Tank M). Residual petroleum hydrocarbons in soil and groundwater. NFA letter received from RWQCB.
• **USTs-124A, 124B**	Former gasoline service facility with two 1,700-gallon steel tanks and dispensing pumps.
• **USTs-4A, 5A**	Two former 10,000-gal gasoline USTs (Tanks 4A and 5A). Residual petroleum hydrocarbons in soil. NFA letter received from City of Oakland Fire Department.
• **USTs-O, P, 6**	One former 12,500-gallon diesel UST, one former 2,000-gallon diesel UST, and one former 10,000-gallon diesel UST. Residual petroleum hydrocarbons in soil. NFA letter received from RWQCB.

TABLE 4-3
TANK GROUPINGS
Oakland Army Base, Oakland, California

Group 3: Former Tank Sites Anticipated to Require Removal of Impacted Soil and Groundwater Monitoring (a)	
• **USTs-4, 5**	Two former 10,000-gal gasoline USTs (Tanks 4 and 5). Residual petroleum hydrocarbons in soil. Four groundwater monitoring wells are currently sampled on quarterly basis. NFA letter requested.
• **USTs-7, 8**	Two former 550-gal waste oil USTs. Residual petroleum hydrocarbons in soil and groundwater. One groundwater monitoring well is currently sampled on semi-annual basis. NFA letter received from RWQCB.
• **UST-18**	One former 500-gal waste oil UST. Residual petroleum hydrocarbons in soil and groundwater. Three groundwater monitoring wells are currently sampled on an annual basis. NFA letter requested.
• **AST-994**	One former 10,000-gallon diesel AST (Facility 994) and reported diesel spill (two 20-gal) associated with the AST. Residual chemicals in soil. A 35 ft by 35 ft area of groundwater contains immiscible diesel fuel. Corrective action required. Three groundwater monitoring wells are currently sampled on semi-annual basis. NFA letter requested.
• **UST-A**	One former 1000-gal fuel oil UST. Residual petroleum hydrocarbons in soil and groundwater. NFA letter received from RWQCB. One groundwater monitoring well is currently monitored on semi-annual basis.
• **USTs-B, C**	Two former 1,000-gal gasoline USTs. Residual petroleum hydrocarbons in soil and groundwater. Nine groundwater monitoring wells are currently sampled on semi-annual basis. NFA letter requested.
• **UST-D**	One former 1000-gal fuel oil UST. Residual petroleum hydrocarbons in soil and groundwater. Two groundwater monitoring wells are currently sampled on a semi-annual basis. No NFA letter request has been made.
• **UST-D1**	One former UST. Residual petroleum hydrocarbons in soil and groundwater. Corrective actions assume three groundwater monitoring wells will be constructed and sampled on a quarterly basis. NFA letter requested.
• **UST-F**	One former 500-gal fuel oil UST. The exact location of this UST has not been confirmed (BASELINE, 2002). Residual petroleum hydrocarbons in soil and groundwater. Five groundwater monitoring wells are currently sampled on a semi-annual basis. No NFA letter request has been made.
• **UST-K**	One former 500-gal fuel oil UST. Residual petroleum hydrocarbons in soil and groundwater. No NFA letter request has been made.
• **UST-Q**	One former 1000-gal gasoline UST. Residual petroleum hydrocarbons in soil and groundwater. Eight groundwater monitoring wells are currently sampled on quarterly basis. No NFA letter request has been made.

TABLE 4-3
TANK GROUPINGS
Oakland Army Base, Oakland, California

Group 4: Former Tank Sites With No Currently Identified Environmental Issues	
--	Approximately 12 former and current buildings with small fuel oil ASTs (50 – 100 gal) (BASELINE, 2002).
• **UST-1**	One former 1,000-gal fuel oil UST. NFA letter received from RWQCB.
• **UST-14A**	One former 550-gal waste oil UST. NFA letter requested.
• **UST-15**	One former 12,500-gal fuel oil UST. NFA letter received from RWQCB.
• **UST-17**	One former 8,000-gal fuel oil UST. NFA letter received from RWQCB.
• **UST-20**	One former 2,000-gal diesel UST. NFA letter requested.
• **UST-3**	One former 250-gal fuel oil UST. NFA letter received from RWQCB.
• **UST-8A**	One former 550-gal waste oil UST. NFA letter requested.
• **UST-9**	One former 2,000-gal gasoline UST. NFA letter received from RWQCB.
• **UST-N**	One former 500-gal waste oil UST near Building 835. NFA letter requested.

Note:

(a) Location of former USTs 11/12/13 and 11A/12A/13A is addressed as a Remedial Action Plan ("RAP") site.

TABLE 4-4
SUMMARY OF LABORATORY ANALYTICAL RESULTS FOR TARRY RESIDUE FROM FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Units	Sample ID, Collection Date, and Laboratory (b)					Universal Treatment Standards for Underlying Hazardous Constituents (c)
		BLDG1 11/9/00 Friedman & Bruya, Inc.	BLDG 1A 2/5/01 Curtis & Tompkins, Ltd.	BLDG 1B 2/5/01 STL Chromalab	BLDG1C 2/5/01 Friedman & Bruya, Inc.	Tarry Sludge 2/4/02 Applied P & Ch Laboratory	
Metals							
Barium	mg/kg	**11.6**	NA (d)	NA	NA	NA	--
Cadmium	mg/kg	**11.1**	NA	NA	NA	NA	--
Chromium	mg/kg	**3.54**	NA	NA	NA	NA	--
Copper	mg/kg	**126**	NA	NA	NA	NA	--
Lead, Total	mg/kg	**11,800**	NA	NA	NA	NA	--
Lead, TCLP (e)	mg/L	NA	NA	NA	NA	**21.4**	0.75
Nickel	mg/kg	**4.07**	NA	NA	NA	NA	--
Vanadium	mg/kg	**1.12**	NA	NA	NA	NA	--
Zinc	mg/kg	**16.4**	NA	NA	NA	NA	--
Corrosivity (f)							
pH	pH	**1.07**	NA	**1.3**	**0.56**	NA	--
Polychlorinated Biphenyls							
PCBs	mg/kg	**13**	NA	NA	NA	NA	10
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	**210**	<970	<200	**48**	NA	3.4
Anthracene	mg/kg	<100	<970	<200	**16**	NA	3.4
Benzo(a)anthracene	mg/kg	<100	<970	<200	<10	NA	3.4
Benzo(a)pyrene	mg/kg	<100	<970	<40	<10	NA	3.4
Benzo(b)fluoranthene	mg/kg	<100	<970	<200	<10	NA	6.8
Benzo(g,h,i)perylene	mg/kg	<100	<970	<400	<10	NA	1.8
Benzo(k)fluoranthene	mg/kg	<100	<970	<400	<10	NA	6.8
Chrysene	mg/kg	<100	<970	<200	**36**	NA	3.4
Dibenzofuran	mg/kg	**170**	<970	<200	**47**	NA	--
Fluoranthene	mg/kg	**150**	<970	<200	**37**	NA	3.4
Fluorene	mg/kg	**180**	<970	<200	**49**	NA	3.4
Indeno(1,2,3-c,d)pyrene	mg/kg	<100	<970	<400	<10	NA	3.4
2-Methylnaphthalene	mg/kg	**240**	<970	<200	**82**	NA	--
Naphthalene	mg/kg	**1,200**	<970	**640**	**410**	NA	5.6
Phenanthrene	mg/kg	**520**	<970	**250**	**140**	NA	5.6
Pyrene	mg/kg	<100	<970	<200	**21**	NA	8.2
Dioxin-like Compounds							
1,2,3,7,8-pentachlorodibenzofuran	mg/kg	**0.075**	NA	NA	NA	NA	--
2,3,7,8-tetrachlorodibenzofuran	mg/kg	**0.0153**	NA	NA	NA	NA	--
Pentachlorinated dibenzofurans, Total	mg/kg	**0.0968**	NA	NA	NA	NA	0.001
Tetrachlorinated dibenzofurans, Total	mg/kg	**0.128**	NA	NA	NA	NA	0.001

TABLE 4-4
SUMMARY OF LABORATORY ANALYTICAL RESULTS FOR TARRY RESIDUE FROM FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Units	Sample ID, Collection Date, and Laboratory (b)					Universal Treatment Standards for Underlying Hazardous Constituents (c)
		BLDG1 11/9/00 Friedman & Bruya, Inc.	BLDG 1A 2/5/01 Curtis & Tompkins, Ltd.	BLDG 1B 2/5/01 STL Chromalab	BLDG1C 2/5/01 Friedman & Bruya, Inc.	Tarry Sludge 2/4/02 Applied P & Ch Laboratory	
Total Petroleum Hydrocarbons							
TPH Gasoline	mg/kg	NA	NA	<10	NA	NA	--
TPH Diesel	mg/kg	NA	NA	**35,000**	NA	NA	--

Notes:

(a) Only chemicals that have been detected in a tarry residue sample are listed.

(b) Table summarizes the laboratory analytical results of samples of tarry residues that exuded to the surface in the crawlspace beneath Building 1.

(c) Universal treatment standards ("UTSs") apply to Resources Conservation and Recovery Act ("RCRA") hazardous wastes that contain underlying hazardous constituents ("UHCs"). Alternative treatment standards exist for contaminated soil that is classified as RCRA hazardous waste. Under 40 CFR § 268.49(c)(1)(A), UHCs in contaminated soil must be treated to achieve a 90 percent reduction in constituent concentrations unless constituent concentrations remaining in treated contaminated soil are less than ten times the relevant UTSs.

(d) NA - Sample was not analyzed for chemical of concern.

(e) Lead concentration as measured in the extract of the Toxicity Characteristic Leaching Procedure ("TCLP")

(f) Under 40 CFR § 261.22(a), a solid waste exhibits the corrosivity characteristc of a D002 RCRA hazardous waste if it is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5.

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (c)							
		OBAS01 / IT02S26	OBAS02 / IT02S27	OBAS03 / IT02S28	OBAS04 / IT02S32	OBAS05 / IT02S33	OBAS06 (dup) / IT03S106 (d)	OBAS07 / IT03S107	OBAS08 / IT10S101
Inorganic Chemicals (b)									
Arsenic	µg/L	**32**	**43**	**37**	**14**	**21**	**5.9/5.2**	**10**	**6.9**
Manganese	µg/L	**320**	**1,900**	**610**	**140**	**65**	**180**	**1,000**	**1,230**
Thallium	µg/L	<4	<4	<4	<2	<2	<2/<2	<2	**5**
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND (e)	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	**0.3**	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	**0.8**	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	**0.5**	**1.4**	**0.9**	**0.34**	ND	ND	ND	**13.3**
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	**1.1**
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	**0.6**
Xylenes, Total	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	ND	ND	**170**	ND	**380**	ND	ND	ND
TPHmo	µg/L	ND	**38**	**170**	ND	**1,900**	ND	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		OBAS09 / IT10S106 (dup)	OBSB01	OBSB02	OBSB03	OBSB04	OBSB05	OBSB06	OBSB07
Inorganic Chemicals (b)									
Arsenic	µg/L	**5.3/6**	**13**	<10	<5	<5	<5	<10	<10
Manganese	µg/L	**1,090/1,020**	**160**	**34**	**77**	**640**	**1,200**	**130**	**3,400**
Thallium	µg/L	**2.8/2.6**	<4	<4	<2	<2	<2	<4	<4
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND/ND	**0.6**	**0.5**	ND	ND	ND	ND	**3.4**
1,3,5-Trimethylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	**0.8**
Acetone	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	**1.1/1.2**	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND/ND	**1.3**	ND	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	ND/ND	ND	ND	ND	**0.9**	ND	ND	ND
Vinyl chloride	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	**0.9**
Xylenes, Total	µg/L	ND/ND	**1.2**	**1.6**	ND	**0.6**	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	ND/ND	<50	<50	<50	<50	<50	<50	<50
TPHmo	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		OBSB08	OBSB09	OBSB10	OBSB11	OBSB12	OBSB13	OBSB14	OBSB15
Inorganic Chemicals (b)									
Arsenic	µg/L	**8.6**	<5	-- (f)	--	--	<10	<10	<10
Manganese	µg/L	**250**	**7,500**	--	--	--	**6,500**	**280**	**2,000**
Thallium	µg/L	<2	<2	--	--	--	<4	<4	<4
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	**0.6**	ND	**0.5**	**0.5**	**6**	ND	**0.8**
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	**2**	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	**0.8**	**0.7**	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	**0.5**	**3.3**	ND	ND	**0.5**	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	**0.9**	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	**ND**	**ND**	ND	**2**	ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	**0.6**	ND	**1.4**
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	ND	**0.8**	ND	**0.7**	ND	**6.5**	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	ND	**0.6**	ND	**0.8**	ND	**14.2**	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	<50	<50	--	--	--	<50	<50	<50
TPHmo	µg/L	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		OBSB16 (dup)	OBMW01	OBMW02	ITMW237	ITMW239	ITMW238	ITMW241	ITMW242
Inorganic Chemicals (b)									
Arsenic	µg/L	<10/<10	<5	**13**	**19.3**	ND	ND	ND	ND
Manganese	µg/L	**680**	**3,600**	**250**	**857**	**1,580**	**3,120**	**238**	**438**
Thallium	µg/L	<4/<4	<2	<2	ND	ND	ND	ND	ND
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	**<20/35.4**	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	**5.3/9.8**	ND	ND	ND	ND	ND	**0.4**	ND
cis-1,2-Dichloroethene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND/ND	ND	ND	ND	ND	ND	**0.98**	ND
n-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	**0.9/1.3**	ND	ND	ND	ND	ND	**0.25**	ND
Vinyl chloride	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	**110/142**	<50	<50	ND	ND	ND	ND	**10**
TPHmo	µg/L	ND/ND	ND	ND	ND	ND	ND	ND	**56**

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		ITMW244 (dup)	ITMW243	ITMW245	ITMW246	ITMW247 (dup)	ITMW248 (dup)	ITMW249	ITMW251
Inorganic Chemicals (b)									
Arsenic	µg/L	ND/ND	ND	ND	**10.9**	**9.26/10.8**	ND/ND	**13.9**	**10.5**
Manganese	µg/L	**626/625**	**2,020**	**202**	**782**	**995/952**	**990/956**	**492**	**521**
Thallium	µg/L	**5.7/6.3**	ND	ND	ND	ND/ND	ND/ND	ND	ND
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Acetone	µg/L	ND/ND	ND	ND	ND	**3.7/3.6**	ND/ND	ND	ND
Benzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Carbon disulfide	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Chloroform	µg/L	ND/ND	ND	ND	**0.3**	**0.35/0.34**	ND/ND	ND	ND
cis-1,2-Dichloroethene	µg/L	**17/18.2**	**0.39**	ND	**0.33**	ND/ND	ND/ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Ethylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	**0.46**	ND
Methylene chloride	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND/ND	ND	ND	**2**	ND/ND	ND/ND	ND	ND
n-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Tetrachloroethene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
n-propylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
sec-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
tert-butylbenzene	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	ND	ND
Trichloroethene	µg/L	ND/ND	ND	ND	**1.6**	ND/ND	ND/ND	ND	ND
Toluene	µg/L	ND/ND	ND	ND	ND	**0.28/ND**	ND/ND	**0.25**	ND
Vinyl chloride	µg/L	**3.8/4**	ND	ND	ND	ND/ND	ND/ND	ND	ND
Xylenes, Total	µg/L	ND/ND	ND	ND	ND	ND/ND	ND/ND	**0.52**	ND
Petroleum Hydrocarbons									
TPHd	µg/L	**16/40**	ND	ND	ND	ND/ND	ND/ND	**200**	ND
TPHmo	µg/L	**ND/37**	ND	ND	ND	ND/ND	ND/ND	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		IT02S29	IT02S30	IT02S31	IT09S69	IT10S100	IT10S102	IT10S103	IT10S104
Inorganic Chemicals (b)									
Arsenic	µg/L	ND	ND	**3.76**	**13.7**	ND	--	--	--
Manganese	µg/L	**840**	**922**	**6.61**	**1,030**	**1,090**	--	--	--
Thallium	µg/L	**10.4**	**8.92**	**11.5**	ND	**6.1**	--	--	--
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	**1.8**	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	**1.9**	ND	**0.4**	**0.4**
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	**8.3**	**2**	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	**0.5**	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	**0.7**	ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND	**0.21**	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	**13.8**	ND	ND
Xylenes, Total	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	ND	ND	ND	ND	**64**	--	--	--
TPHmo	µg/L	ND	ND	ND	ND	ND	--	--	--

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		IT11S62	IT11S63	IT11S64	IT11S66	IT11S67	IT11S68	IT11S70 (dup)	IT11S71
Inorganic Chemicals (b)									
Arsenic	µg/L	**11**	**4.4**	**1.2**	**15**	**5.7**	ND	**12.3/12.4**	**25.7**
Manganese	µg/L	**543**	**267**	**601**	**1,830**	**120**	**436**	**274/229**	**274**
Thallium	µg/L	**3.2**	**2.2**	**6.2**	**5.8**	**3**	ND	ND/ND	**6.58**
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	**0.3**
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	**0.6**	ND	ND	ND/ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Ethylbenzene	µg/L	**1**	ND	ND	ND	ND	ND	ND/ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	**0.6**	ND/ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Toluene	µg/L	ND	ND	ND	ND	ND	**0.33**	ND/ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Xylenes, Total	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	**200**	**34**	**75**	**20**	**16**	ND	ND/ND	ND
TPHmo	µg/L	ND	ND	ND	ND	ND	ND	ND/ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		IT11S72	IT12S31	IT12S32	IT12S33	IT12S34	IT13S21	IT13S22	IT13S24
Inorganic Chemicals (b)									
Arsenic	µg/L	**10.1**	**13.5**	**26.4**	ND	**4.4**	**4.76**	ND	**6.8**
Manganese	µg/L	**2,330**	**8,490**	**12,400**	**9,730**	**1,660**	**15.6**	**95.2**	**117**
Thallium	µg/L	ND	**11.1**	**14.7**	ND	**2.2**	**14.1**	**6.57**	**2.9**
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	**0.91**	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	**2.5**	ND
cis-1,2-Dichloroethene	µg/L	**0.36**	ND	ND	ND	ND	ND	ND	**57**
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	**0.31**	ND	ND	ND	ND	ND	**11**	ND
Toluene	µg/L	ND	ND	**0.5**	**0.26**	ND	**0.3**	**0.5**	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	ND	ND	ND	ND	**15**	ND	ND	**150**
TPHmo	µg/L	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		IT13S25	IT14S01	IT14S02	IT16S56	IT16S57	IT23S04	IT23S05	IT23S06
Inorganic Chemicals (b)									
Arsenic	µg/L	**10.5**	ND	ND	ND	**7.9**	**15.3**	ND	**9.3**
Manganese	µg/L	**3,000**	**386**	**1,210**	**125**	**283**	**43.7**	**886**	**27.3**
Thallium	µg/L	ND	**7.46**	**7.4**	**4**	ND	**6.8**	ND	**1.3**
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	**0.32**	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	**3**	ND	**0.7**
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	**0.25**	ND	ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	ND	ND	**0.38**	ND	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	ND	ND	ND	**31**	ND	**82**	ND	**21**
TPHmo	µg/L	ND	ND	ND	**57**	ND	ND	ND	**31**

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		IT23S07	IT23S08	IT23S09	IT23S10	IT23S11	IT23S12	IT23S13	IT23S14
Inorganic Chemicals (b)									
Arsenic	µg/L	**5.2**	**9.6**	**10.1**	**3.4**	**4.6**	**1.5**	**12.3**	**11.3**
Manganese	µg/L	**1,110**	**1,140**	**69**	**53.4**	**1,100**	**265**	**108**	**234**
Thallium	µg/L	**5.3**	ND	**4.2**	ND	**5.9**	**3.2**	**3.5**	ND
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	**0.9**	**30.4**	ND	ND	**0.9**	ND
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	**0.43**	**0.27**	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	ND	**0.26**	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	**130**	ND	**23**	ND	ND	ND	**23**	ND
TPHmo	µg/L	**252**	ND	ND	ND	ND	ND	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		IT24S14	IT24S15	IT25S15	A991S13	A991S14	A991S16	A991S17	A991S19
Inorganic Chemicals (b)									
Arsenic	µg/L	**2.7**	**9.3**	**1.8**	--	--	--	--	--
Manganese	µg/L	**110**	**157**	**14.2**	--	--	--	--	--
Thallium	µg/L	**5.2**	**2.1**	**2.9**	--	--	--	--	--
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND	--	--	--	--	--
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
Acetone	µg/L	ND	ND	ND	--	--	--	--	--
Benzene	µg/L	ND	ND	ND	--	--	--	--	--
Carbon disulfide	µg/L	ND	ND	ND	--	--	--	--	--
Chloroform	µg/L	ND	ND	ND	--	--	--	--	--
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	--	--	--	--	--
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	--	--	--	--	--
Ethylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
Methylene chloride	µg/L	ND	ND	ND	--	--	--	--	--
Methyl tertiary butyl ether	µg/L	ND	ND	ND	--	--	--	--	--
n-butylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
Tetrachloroethene	µg/L	ND	ND	ND	--	--	--	--	--
n-propylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
sec-butylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
tert-butylbenzene	µg/L	ND	ND	ND	--	--	--	--	--
Trichloroethene	µg/L	ND	ND	ND	--	--	--	--	--
Toluene	µg/L	ND	ND	ND	--	--	--	--	--
Vinyl chloride	µg/L	ND	ND	ND	--	--	--	--	--
Xylenes, Total	µg/L	ND	ND	ND	--	--	--	--	--
Petroleum Hydrocarbons									
TPHd	µg/L	**33**	**18**	**8**	**110**	**310**	**590**	**96**	**180**
TPHmo	µg/L	ND	ND	ND	**44**	**35**	**59**	ND	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		A991S20	A991S21	A991S22	ITT651S01	ITT651S02	ITT671S01	ITT673S01	ITT673S02
Inorganic Chemicals (b)									
Arsenic	µg/L	--	--	--	--	--	--	--	--
Manganese	µg/L	--	--	--	--	--	--	--	--
Thallium	µg/L	--	--	--	--	--	--	--	--
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	--	--	--	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	--	--	--	**0.26**	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	--	--	--	ND	ND	ND	ND	ND
Acetone	µg/L	--	--	--	ND	ND	ND	ND	ND
Benzene	µg/L	--	--	--	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	--	--	--	ND	ND	ND	ND	ND
Chloroform	µg/L	--	--	--	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	--	--	--	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	--	--	--	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	--	--	--	**0.31**	ND	ND	ND	ND
Methylene chloride	µg/L	--	--	--	ND	ND	ND	**85**	ND
Methyl tertiary butyl ether	µg/L	--	--	--	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	--	--	--	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	--	--	--	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	--	--	--	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	--	--	--	ND	ND	ND	ND	ND
tert-butylbenzene	µg/L	--	--	--	ND	ND	ND	ND	ND
Trichloroethene	µg/L	--	--	--	ND	ND	ND	ND	ND
Toluene	µg/L	--	--	--	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	--	--	--	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	--	--	--	**0.31**	ND	ND	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	**35**	**190**	**37**	**130**	**42**	**1,000**	**115,000**	**200**
TPHmo	µg/L	ND	ND	**66**	ND	ND	ND	**2,200**	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)							
		ITT677S01	ITT677S02	ITT678S01 (dup)	ITT678S02	ITT679S01	ITT679S02	ITT682S01	ITT682S02
Inorganic Chemicals (b)									
Arsenic	µg/L	--	--	--	--	--	--	--	--
Manganese	µg/L	--	--	--	--	--	--	--	--
Thallium	µg/L	--	--	--	--	--	--	--	--
Volatile Organic Compounds									
1,1-Dichloroethane	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	**1,300/ND**	ND	ND	ND	ND	ND
Benzene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Methylene chloride	µg/L	ND	ND	**490/290**	ND	ND	ND	ND	ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
n-butylbenzene	µg/L	ND	ND	**320/290**	ND	ND	ND	**84**	ND
Tetrachloroethene	µg/L	ND	ND	**ND/390**	ND	ND	ND	ND	ND
n-propylbenzene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
sec-butylbenzene	µg/L	ND	ND	**ND/170**	ND	ND	ND	**46**	ND
tert-butylbenzene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	**ND/46**	ND	ND	ND	ND	ND
Toluene	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND/ND	ND	ND	ND	ND	ND
Xylenes, Total	µg/L	ND	ND	ND/ND	ND	ND	**0.22**	ND	ND
Petroleum Hydrocarbons									
TPHd	µg/L	**320**	**510**	**1,220,000 (g)**	**570,000**	**610**	**3,200**	**440,000**	**470,000**
TPHmo	µg/L	ND	ND	**ND/940**	**24,000**	ND	**110**	**13,000**	ND

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Chemicals of Concern (a)	Units	Sample Identification (b)					
		ITT686S01	ITT686S02	ITT688S01	ITT688S02	ITT722S01	ITT722S02 (dup)
Inorganic Chemicals (b)							
Arsenic	µg/L	--	--	--	--	--	--
Manganese	µg/L	--	--	--	--	--	--
Thallium	µg/L	--	--	--	--	--	--
Volatile Organic Compounds							
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND/ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND/ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND	ND	ND/ND
Acetone	µg/L	ND	ND	**1,100**	**1,200**	ND	ND/ND
Benzene	µg/L	ND	ND	ND	ND	ND	ND/ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND/ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND/ND
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND/ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND/ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND/ND
Methylene chloride	µg/L	ND	ND	**350**	**560**	ND	ND/ND
Methyl tertiary butyl ether	µg/L	ND	ND	ND	ND	ND	ND/ND
n-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND/ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND/ND
n-propylbenzene	µg/L	ND	ND	ND	**320**	ND	ND/ND
sec-butylbenzene	µg/L	ND	ND	ND	**390**	ND	ND/ND
tert-butylbenzene	µg/L	ND	ND	ND	ND	ND	ND/ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND/ND
Toluene	µg/L	ND	ND	ND	ND	ND	ND/ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND/ND
Xylenes, Total	µg/L	ND	ND	ND	ND	ND	ND/ND
Petroleum Hydrocarbons							
TPHd	µg/L	**13,000**	**530,000**	**181,000**	**6,570,000**	ND	**200/300**
TPHmo	µg/L	**400**	**19,000**	**2,400**	**73,000**	ND	**170/260**

TABLE 4-5
ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED DURING ARMY / OBRA PHASE II INVESTIGATIONS
Oakland Army Base, Oakland, California

Notes:

(a) Only selected chemicals analyzed in groundwater during the Army / OBRA Phase II Investigations are listed. Other organic chemicals detected only once or twice at minor concentrations are not listed and include total petroleum hydrocarbons as gasoline, fluoranthene, phenanthrene, benzo(b)fluroanthene, 1,1,1-trichloroethane, 1,2-dichloropropane, 1,4-dichlorobenzene, p-cymene, and isopropylbenzene. For complete laboratory analysis reports, see the Army and OBRA Phase II Investigation reports (IT, 2002a; EKI, 2002) and Appendix A.

(b) Groundwater samples analyzed for inorganic chemicals were either field filtered or collected from monitoring wells using low-flow sampling techniques.

(c) Samples were collected in May 2002, and the sampling depth varied from 5 to 10 feet below ground surface (see EKI, 2002; IT, 2002a).

(d) Laborary analytical results for samples with duplicate ("dup") analysis are indicated by a slash ("/") between the two values.

(e) "ND" indicates that the chemical was not detected above analytical method reporting limits.

(f) "--" indicated that the sample was not analyzed for the chemical of concern.

(g) The duplicate result total petroleum hydocarbons as diesel in this sample was 43,200 micrograms per liter.

TABLE 5-1
AMBIENT METAL CONCENTRATIONS IN SOIL

Oakland Army Base, Oakland, California

Metal	Background Concentration (mg/kg)		
	OARB (a) 95th Percentile	LBNL (b) 95th Percentile	Selected Value (c)
Antimony	2.2	5.5	2.2
Arsenic	17	19.1	17
Barium	260	--	260
Beryllium	0.95	1.0	0.95
Cadmium	1.6	2.7	1.6
Chromium	67	99.6	67
Cobalt	19	--	19
Copper	71	69.4	71
Lead	51	16.1	51
Manganese	960	--	960
Mercury	0.88	0.4	0.88
Molybdenum	--	--	--
Nickel	79	119.8	79
Selenium	2.4	5.6	2.4
Silver	--	1.8	1.8
Thallium	--	27.1	27.1
Vanadium	63	--	63
Zinc	160	106.1	160

Notes:

(a) Background concentrations for the OARB obtained from ICF Kaiser Engineers, April 1999, *Attachment A to the Risk Assessment Work Plan, Ambient Data Analysis for Soil, Oakland Army Base, California.*

(b) Background concentrations for Lawrence Berkeley National Laboratory ("LBNL") obtained from Lawrence Berkeley National Laboratory, 1995, *Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory.*

(c) If possible, naturally occurring or background metal concentrations in soil are based on ICF Kaiser Engineers statistical analysis of data for background soil samples collected at the OARB.

TABLE 5-2
CHEMICALS OF CONCERN IN SOIL AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Metals						
Antimony	48	18	37.5%	0.095	3.3	31
Arsenic	48	48	100.0%	1.4	31.3	0.39
Barium	48	48	100.0%	12.3	505	5,375
Beryllium	48	16	33.3%	0.13	1.03	154
Cadmium	48	28	58.3%	0.024	17	37
Chromium, Total	48	48	100.0%	0.21	213	211
Cobalt	48	48	100.0%	1.4	64.2	4,693
Copper	48	48	100.0%	2.8	104	2,905
Lead	48	48	100.0%	2.1	2,980 (c)	400
Manganese	30	30	100.0%	60	1,150	1,800
Mercury	48	46	95.8%	0.02	2.8	23
Molybdenum	48	13	27.1%	0.53	1.52	391
Nickel	48	48	100.0%	0.75	287	1,564
Selenium	48	39	81.3%	0.15	8.9	390
Silver	48	2	4.2%	1.4	1.9	391
Thallium	48	0	0.0%	ND (d)	ND	5.2
Vanadium	48	48	100.0%	2.8	46.5	547
Zinc	48	48	100.0%	16.3	988	23,000

TABLE 5-2
CHEMICALS OF CONCERN IN SOIL AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Volatile Organic Compounds						
1,2,3-trichloropropane	46	1	2.2%	0.32	0.32	0.0014
1,2,4-trimethylbenzene	46	14	30.4%	0.001	10	52
1,3,5-trimethylbenzene	46	12	26.1%	0.001	3	21
Acetone	36	16	44.4%	0.014	0.66	1,570
Benzene	50	5	10.0%	0.002	0.12	0.65
Carbon disulfide	46	6	13.0%	0.0006	0.01	355
Carbon tetrachloride	46	1	2.2%	0.94	0.94	0.24
cis-1,2,-dichloroethene	46	1	2.2%	0.23	0.23	43
Ethylbenzene	50	11	22.0%	0.0004	2.1	230
Isopropylbenzene (Cumene)	46	9	19.6%	0.011	0.8	157
Methylene chloride	46	25	54.3%	0.001	0.74	8.9
Methyl ethyl ketone (2-butanone)	40	11	27.5%	0.00266	5.8	(b)
Methyl isobutyl ketone	46	7	15.2%	0.0008	0.017	790
n-propylbenzene	46	9	19.6%	0.02	1.5	145
p-cymene (p-isopropyltoluene)	46	11	23.9%	0.001	2.2	157
sec-butylbenzene	46	10	21.7%	0.001	1	111
Tetrachloroethene	46	1	2.2%	1.0	1.0	5.7
Toluene	50	10	20.0%	0.0007	0.57	520
Trichloroethene	46	2	4.3%	0.013	2	2.8
Xylenes, Total	50	15	30.0%	0.0008	8.5	210

TABLE 5-2
CHEMICALS OF CONCERN IN SOIL AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Semi-volatile Organic Compounds						
Acenaphthene	66	1	1.5%	0.1	0.1	3,682
Acenaphthylene	66	1	1.5%	0.61	0.61	(e)
Anthracene	66	11	16.7%	0.022	0.33	21,896
Benzo(a)anthracene	66	17	25.8%	0.033	26.8	0.62
Benzo(a)pyrene	66	4	6.1%	0.035	1	0.062
Benzo(b)fluoranthene	66	14	21.2%	0.0008	0.51	0.62
Benzo(g,h,i)perylene	66	4	6.1%	0.036	0.22	(e)
Benzo(k)fluoranthene	66	9	13.6%	0.002	0.54	0.61
Chrysene	66	27	40.9%	0.002	11	62
Dibenz(a,h)anthracene	66	9	13.6%	0.039	7.6	0.062
Fluoranthene	66	25	37.9%	0.038	20.8	2,294
Fluorene	66	4	6.1%	0.019	0.519	2,644
Ideno(1,2,3-c,d)pyrene	66	2	3.0%	0.047	0.14	0.62
Naphthalene	112	24	21.4%	0.0004	7.7	56
Phenanthrene	66	21	31.8%	0.003	8.8	(e)
Pyrene	66	19	28.8%	0.024	27	2,309
Total Petroleum Hydrocarbons						
TPH Diesel	53	39	73.6%	2	63,000	(e)
TPH Motor Oil	57	45	78.9%	8	430,000	(e)
TPH Recoverable	2	1	50.0%	790	790	(e)

TABLE 5-2
CHEMICALS OF CONCERN IN SOIL AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
PCBs, Pesticides, and Herbicides (Note: one (1) detection of PCBs is noted in Army documents at the concentration of 0.22 mg/kg, but not found in database).						
Dioxin-like Compounds						
1,2,3,4,6,7,8-heptachlorodibenzofuran	18	9	50.0%	0.0000031	0.00062	0.000004 (f)
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	18	9	50.0%	0.0000068	0.0006	0.000004
1,2,3,4,7,8,9-heptachlorodibenzofuran	18	7	38.9%	0.0000032	0.00019	0.000004
1,2,3,4,7,8-hexachlorodibenzofuran	18	8	44.4%	0.000013	0.00072	0.000004
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	18	7	38.9%	0.0000094	0.000047	0.000004
1,2,3,6,7,8-hexachlorodibenzofuran	18	8	44.4%	0.0000062	0.0008	0.000004
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	18	8	44.4%	0.00001	0.00026	0.000004
1,2,3,7,8,9-hexachlorodibenzofuran	18	2	11.1%	0.0000056	0.0000071	0.000004
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	18	8	44.4%	0.0000041	0.0001	0.000004
1,2,3,7,8-pentachlorodibenzofuran	18	6	33.3%	0.0000058	0.00034	0.000004
1,2,3,7,8-pentachlorodibenzo-p-dioxin	18	8	44.4%	0.0000064	0.00015	0.000004
2,3,4,6,7,8-hexachlorodibenzofuran	18	8	44.4%	0.0000047	0.00063	0.000004
2,3,4,7,8-pentachlorodibenzofuran	18	8	44.4%	0.0000076	0.0006	0.000004
2,3,7,8-tetrachlorodibenzofuran	18	7	38.9%	0.000008	0.00013	0.000004
2,3,7,8-tetrachlorodibenzo-p-dioxin	18	10	55.6%	0.0000012	0.000026	0.000004
Heptachlorinated dibenzofurans, Total	5	4	80.0%	0.000052	0.00097	0.000004
Heptachlorinated dibenzo-p-dioxins, Total	5	4	80.0%	0.00012	0.0011	0.000004
Hexachlorinated dibenzofurans, Total	5	5	100.0%	0.00011	0.0039	0.000004
Hexachlorinated dibenzo-p-dioxins, Total	5	4	80.0%	0.00096	0.0023	0.000004
Octachlorodibenzofuran	18	6	33.3%	0.0000076	0.000089	0.000004
Octachlorodibenzo-p-dioxin	18	9	50.0%	0.000012	0.00024	0.000004

TABLE 5-2
CHEMICALS OF CONCERN IN SOIL AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Dioxins						
Pentachlorinated dibenzofurans, Total	5	5	100.0%	0.00022	0.002	0.000004
Pentachlorinated dibenzo-p-dioxins, Total	5	4	80.0%	0.00052	0.0011	0.000004
Tetrachlorinated dibenzofurans, Total	5	5	100.0%	0.00013	0.0011	0.000004
Tetrachlorinated dibenzo-p-dioxins, Total	5	4	80.0%	0.00019	0.0006	0.000004

Notes:

(a) Screening to identify chemicals of concern performed on electronic database provided by IT Corporation on 5 March 2002. Refer to text of RAP for methodology employed to identify chemicals of concern.

(b) U.S. EPA Region IX Preliminary Remediation Goal ("PRG") for residential land use.

(c) Lead found in tarry waste material at 11,800 mg/kg in one sample, but not in database.

(d) Chemical has not been detected in soil samples at concentrations greater than analytical method reporting limits.

(e) No residential PRG is available for compound.

(f) Dioxin-like compounds are often found in complex mixtures. A toxicity equivalency procedure has been developed by U.S. EPA to describe the cumulative toxicity of these mixtures relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin. PRG cited is for 2,3,7,8-tetrachlorodibenzo-p-dioxin.

TABLE 5-3
CHEMICALS OF CONCERN IN GROUNDWATER AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Metals						
Antimony	16	2	12.5%	(d)	(d)	6
Arsenic	16	3	18.8%	(d)	(d)	50
Barium	16	16	100.0%	(d)	(d)	1,000
Beryllium	16	0	0.0%	(d)	(d)	4
Cadmium	16	0	0.0%	(d)	(d)	5
Chromium, Total	17	7	41.2%	(d)	(d)	50
Cobalt	16	6	37.5%	(d)	(d)	2,200
Copper	16	15	93.8%	(d)	(d)	1,400
Lead	17	14	82.4%	(d)	(d)	(e)
Manganese	13	13	100.0%	(d)	(d)	880
Mercury	16	9	56.3%	(d)	(d)	2
Molybdenum	16	8	50.0%	(d)	(d)	180
Nickel	17	12	70.6%	(d)	(d)	100
Selenium	16	1	6.3%	(d)	(d)	180
Silver	16	2	12.5%	(d)	(d)	180
Thallium	16	5	31.3%	(d)	(d)	2
Vanadium	16	6	37.5%	(d)	(d)	260
Zinc	17	6	35.3%	(d)	(d)	11,000

TABLE 5-3
CHEMICALS OF CONCERN IN GROUNDWATER AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Volatile Organic Compounds						
1,2,4-trimethylbenzene	16	1	6.3%	3.2	3.2	120
1,3,5-trimethylbenzene	16	1	6.3%	0.7	0.7	120
1,2-dichloropropane	16	1	6.3%	0.6	0.6	(b)
Acetone	13	2	15.4%	31	32	610
Carbon disulfide	16	1	6.3%	0.5	0.5	1,000
cis-1,2-dichloroethene	16	2	12.5%	1.2	4.8	6
Methylene chloride	16	8	50.0%	0.5	2	5
Methyl isobutyl ketone	16	3	18.8%	5	6	160
Methyl teriary butyl ether	16	3	18.8%	2	2.1	6.2
n-propylbenzene	16	1	6.3%	0.6	0.6	61
p-cymene (p-isopropyltoluene)	16	1	6.3%	0.6	0.6	660
Toluene	21	1	4.8%	1	1	150
Vinyl chloride	16	2	12.5%	0.4	3.7	0.5
Xylenes, Total	21	2	9.5%	0.8	5	1,750
Semi-volatile Organic Compounds						
Chrysene	20	1	5.0%	3.1	3.1	9.2
Fluoranthene	20	1	5.0%	1.1	1.1	1,500
Naphthalene	35	2	5.7%	0.6	3	6.2
Phenanthrene	20	1	5.0%	0.7	0.7	(e)

TABLE 5-3
CHEMICALS OF CONCERN IN GROUNDWATER AT FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Total Petroleum Hydrocarbons						
TPH Diesel	18	13	72.2%	50	2,700	(e)
TPH Motor Oil	13	12	92.3%	140	6,500	(e)

Notes:

(a) Screening to identify chemicals of concern performed on electronic database provided by IT Corporation on 5 March 2002. Refer to text of RAP for methodology employed to identify chemicals of concern.

(b) Federal or State of California Maximum Contaminant Level ("MCL").

(c) U.S. EPA Region IX Preliminary Remediation Goal for tap water ("twPRG") when no MCL is available.

(d) All unfiltered and filtered groundwater metal data were retained in the COC database for purposes of identifying chemicals to be retained as COCs. However, summary statistics on metal concentrations in groundwater were not calculated because such statistics are not representative of dissolved concentrations due to artificially high concentrations of metals measured in unfiltered groundwater samples with excessive turbidity.

(e) No MCL or twPRG are available for compound.

TABLE 5-4
CHEMICALS OF CONCERN IN SOIL OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Metals						
Antimony	431	119	27.6%	0.091	673	31
Arsenic	452	331	73.2%	0.222	101	0.39
Barium	430	428	99.5%	4.77	2,952	5,375
Beryllium	418	198	47.4%	0.057	3.8	154
Cadmium	491	124	25.3%	0.01	8.45	37
Chromium, Total	544	526	96.7%	0.02	1,480	211
Cobalt	424	390	92.0%	0.54	1,000	4,693
Copper	428	406	94.9%	0.72	8,120	2,905
Lead	711	586	82.4%	0.0024	15,230	400
Manganese	250	250	100%	24.8	1,620	1,800
Mercury	438	317	72.4%	0.0047	147	23
Molybdenum	418	81	19.4%	0.071	13	391
Nickel	486	422	86.8%	0.24	380	1,564
Selenium	440	110	25.0%	0.2	55	390
Silver	457	47	10.3%	0.07	860	391
Thallium	418	20	4.8%	0.081	3.25	5.2
Vanadium	418	417	99.8%	2.3	104	547
Zinc	484	461	95.2%	0.34	11,050	23,000

TABLE 5-4
CHEMICALS OF CONCERN IN SOIL OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Volatile Organic Compounds						
1,1,2,2-tetrachloroethane (c)	516	4	0.8%	0.0083	0.067	0.38
1,1,2-trichloroethane (c)	516	0	0.0%	ND (d)	ND	0.84
1,1-dichloroethane (c)	539	0	0.0%	ND	ND	590
1,1-dichloroethene	539	1	0.2%	0.45	0.45	0.054
1,2,4-trimethylbenzene (c)	349	19	5.4%	0.00086	7.9	52
1,2-dichloroethane (c)	536	0	0.0%	ND	ND	0.35
1,3,5-trimethylbenzene (c)	349	15	4.3%	0.0009	2.1	21
Acetone	449	128	28.5%	0.005	0.377	1,570
Benzene	995	50	5.0%	0.0004	70	0.65
Bromodichloromethane (c)	533	1	0.2%	0.054	0.054	1.0
Carbon disulfide	450	31	6.9%	0.0008	0.023	355
Carbon tetrachloride (c)	516	1	0.2%	0.018	0.018	0.24
Chloroform (c)	541	3	0.6%	0.0007	0.00182	0.24
Dibromochloromethane (c)	497	0	0.0%	ND	ND	1.1
cis-1,2-dichloroethene (c)	489	11	2.2%	0.0007	0.052	43
trans-1,2-dichloroethene (c)	538	4	0.7%	0.007	0.047	63
Ethylbenzene	995	83	8.3%	0.00073	800	230
Isopropylbenzene (Cumene); (c)	225	8	3.6%	0.0011	13	157
Methyl ethyl ketone (2-butanone)	450	40	8.9%	0.00275	0.0655	(b)
Methyl isobutyl ketone	450	23	5.1%	0.0004	0.00225	790
Methyl teriary butyl ether (c)	330	14	4.2%	0.00077	2.7	16.7
Methylene chloride	575	99	17.2%	0.0004	0.39	8.9
n-butylbenzene (c)	226	11	4.9%	0.00098	31	145
n-propylbenzene (c)	225	11	4.9%	0.0019	37	145

TABLE 5-4
CHEMICALS OF CONCERN IN SOIL OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Volatile Organic Compounds						
p-cymene (p-isopropyltoluene)	225	4	1.8%	0.00069	1.2	157
sec-butylbenzene (c)	225	10	4.4%	0.0011	23	111
tert-Butylbenzene (c)	225	6	2.7%	0.00151	1.2	131
Tetrachloroethene (c)	589	31	5.3%	0.0005	0.032	5.7
Toluene	995	94	9.4%	0.0004	730	520
Trichloroethene (c)	547	15	2.7%	0.0016	0.46	2.8
Trichlorofluoromethane (c)	516	1	0.2%	0.00241	0.00241	386
Vinyl chloride (c)	539	5	0.9%	0.004	0.013	0.15
Xylenes, Total	995	120	12.1%	0.0005	4,300	210
Semi-volatile Organic Compounds						
Acenaphthene	493	14	2.8%	0.01	5.2	3,682
Acenaphthylene	493	10	2.0%	0.056	2.4	(e)
Anthracene	493	85	17.2%	0.0003	4.24	21,896
Benzidine	89	2	2.2%	6.3	48	0.002
Benzo(c)anthracene	493	134	27.2%	0.0006	4	0.62
Benzo(c)pyrene	493	124	25.2%	0.0007	2.6	0.062
Benzo(c)fluoranthene	470	142	30.2%	0.0003	3.3	0.62
Benzo(b,k)fluoranthene	23	2	8.7%	1.9	1.9	0.62
Benzo(g,h,i)perylene	493	74	15.0%	0.001	3	(e)
Benzo(k)fluoranthene	470	95	20.2%	0.0003	1.4	0.61
Bis(2-ethylhexyl)phthalate	142	16	11.3%	0.043	4.8	35
Chrysene	493	156	31.6%	0.0002	7.7	62
Dibenz(a,h)anthracene	464	58	12.5%	0.002	1.3	0.062

TABLE 5-4
CHEMICALS OF CONCERN IN SOIL OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
Semi-volatile Organic Compounds						
Fluoranthene	493	131	26.6%	0.0008	130	2,294
Fluorene	493	29	5.9%	0.0006	55	2,644
Indeno(1,2,3-c,d)pyrene	493	78	15.8%	0.001	1.1	0.62
Naphthalene	695	26	3.7%	0.0005	6	56
Phenanthrene	493	151	30.6%	0.0007	280	(e)
Pyrene	493	148	30.0%	0.001	90	2,309
Total Petroleum Hydrocarbons						
TPH Diesel	1,245	425	34.1%	0.0031	11,000	(e)
TPH Gasoline	778	181	23.3%	0.00341	100,000	(e)
TPH Motor Oil	702	375	53.4%	2	28,000	(e)
TPH Recoverable	179	93	52.0%	0.094	22,000	(e)
PCBs, Pesticides, and Herbicides						
Aldrin	113	7	6.2%	0.002	0.16	0.03
Alpha BHC (c)	111	1	0.9%	0.02	0.02	(e)
Alpha endosulfan (Endosulfan I)	99	4	4.0%	0.0003	0.013	367
Alpha chlordane	41	15	36.6%	0.0007	3.4	1.6
Gamma chlordane	41	15	36.6%	0.0009	4.0	2
Dieldrin	113	21	18.6%	0.0004	11.4	0.03
Endosulfan sulfate (c)	111	3	2.7%	0.001	0.002	(e)
Endrin	111	5	4.5%	0.001	1.35	18
Endrin aldehyde	103	3	2.9%	0.001	0.05	(e)
Gamma BHC (Lindane)	113	5	4.4%	0.0004	0.02	0.44

TABLE 5-4
CHEMICALS OF CONCERN IN SOIL OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg); (b)
PCBs, Pesticides, and Herbicides						
Heptachlor	113	6	5.3%	0.0004	1.2	0.11
Heptachlor epoxide (c)	98	4	4.1%	0.0003	0.02	0.05
4,4'-DDD	113	27	23.9%	0.0003	5.3	2.4
4,4'-DDE	113	29	25.7%	0.0005	1.2	1.7
4,4'-DDT	113	29	25.7%	0.0006	10	1.7
Pentachlorophenol	38	23	60.5%	0.011	3.8	3.0
Toxaphene	113	0	0.0%	ND (d)	ND	0.44
PCB-1248 (Aroclor 1248)	147	2	1.4%	0.25	0.3	0.22
PCB-1260 (Aroclor 1260)	147	8	5.4%	0.016	0.3	0.22

Notes:

(a) Screening to identify chemicals of concern performed on electronic database provided by IT Corporation on 5 March 2002. Refer to text of RAP for methodology employed to identify chemicals of concern.

(b) U.S. EPA Region IX Preliminary Remediation Goal ("PRG") for residential land use.

(c) Chemical is retained as a chemical of concern because its presence has been detected in groundwater.

(d) Chemical has not been detected in soil samples at concentrations greater than analytical method reporting limits.

(e) No residential PRG is available for compound.

TABLE 5-5
CHEMICALS OF CONCERN IN GROUNDWATER OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Metals						
Antimony	257	79	30.7%	(d)	(d)	6
Arsenic	336	245	72.9%	(d)	(d)	50
Barium	311	308	99.0%	(d)	(d)	1,000
Beryllium	257	45	17.5%	(d)	(d)	4
Cadmium	458	82	17.9%	(d)	(d)	5
Chromium, Total	458	201	43.9%	(d)	(d)	50
Cobalt	257	112	43.6%	(d)	(d)	2,200
Copper	301	182	60.5%	(d)	(d)	1,400
Lead	463	203	43.8%	(d)	(d)	(e)
Manganese	266	262	98.5%	(d)	(d)	880
Mercury	331	116	35.0%	(d)	(d)	2
Molybdenum	257	117	45.5%	(d)	(d)	180
Nickel	404	182	45.0%	(d)	(d)	100
Selenium	318	101	31.8%	(d)	(d)	180
Silver	311	77	24.8%	(d)	(d)	180
Thallium	256	43	16.8%	(d)	(d)	2
Vanadium	257	135	52.5%	(d)	(d)	260
Zinc	448	278	62.1%	(d)	(d)	11,000

TABLE 5-5
CHEMICALS OF CONCERN IN GROUNDWATER OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Volatile Organic Compounds						
1,1,2,2-tetrachloroethane	781	10	1.3%	0.11	200	1
1,1,2-trichloroethane	781	6	0.8%	0.7	19	5
1,1-dichloroethane	788	14	1.8%	0.06	24	5
1,1-dichloroethene	802	19	2.4%	0.3	85.4	6
1,2,4-trimethylbenzene	514	84	16.3%	0.06	117	120
1,2-dichloroethane	802	25	3.1%	0.05	11	0.5
1,3,5-trimethylbenzene	514	49	9.5%	0.06	180	120
Acetone	549	94	17.1%	1.89	99	610
Benzene	1,564	312	19.9%	0.03	2,500	1
Bromodichloromethane	798	1	0.1%	1.8	2	0.18
Carbon tetrachloride	777	4	0.5%	0.4	29.2	0.5
Chloroform	798	28	3.5%	0.17	28	0.16
Dibromochloromethane	777	1	0.1%	0.6	1	0.13
cis-1,2-dichloroethene	656	211	32.2%	0.05	2,020	6
trans-1,2-dichloroethene	802	117	14.6%	0.08	300	10
Ethylbenzene	1,563	277	17.7%	0.06	91,300	700
Isopropylbenzene (Cumene)	444	27	6.1%	0.12	520,000	660
Methyl teriary butyl ether	704	224	31.8%	0.05	28,500	6.2
Methylene chloride	777	86	11.1%	0.3	8	5
n-butylbenzene	444	3	0.7%	1.05	7.3	61
n-propylbenzene	444	23	5.2%	0.05	73	61
p-cymene (p-isopropyltoluene)	444	9	2.0%	0.7	520,000	660
sec-butylbenzene	444	18	4.1%	0.47	570,000	61

TABLE 5-5
CHEMICALS OF CONCERN IN GROUNDWATER OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Volatile Organic Compounds						
tert-butylbenzene	444	9	2.0%	0.6	580,000	61
Tetrachloroethene	790	45	5.7%	0.06	31	5
Toluene	1,567	365	23.3%	0.06	7,550	150
Trichloroethene	791	121	15.3%	0.08	363	5
Trichlorofluoromethane	776	1	0.1%	190	190	150
Vinyl chloride	801	153	19.1%	0.07	640	0.5
Xylenes, Total	1,562	412	26.4%	0.11	158,000	1,750
Semi-volatile Organic Compounds						
Acenaphthene	418	15	3.6%	0.3	41,000	370
Acenaphthylene	418	3	0.7%	0.19	0.66	(e)
Anthracene	418	33	7.9%	0.01	30,600	1,800
Benzo(a)anthracene	418	28	6.7%	0.04	44,900	0.092
Benzo(a)pyrene	418	11	2.6%	0.01	12	0.0092
Benzo(b)fluoranthene	378	11	2.9%	0.02	1300	0.092
Benzo(g,h,i)perylene	418	3	0.7%	0.04	8.6	(e)
Benzo(k)fluoranthene	378	6	1.6%	0.01	1,100	0.92
Bis(2-ethylhexyl)phthalate	89	8	9.0%	2.9	6.6	4.8
Chrysene	418	18	4.3%	0.02	6,900	9.2
Dibenzo(a,h)anthracene	394	1	0.3%	1.44	1.44	0.0092
Fluoranthene	418	40	9.6%	0.02	100,000	1,500
Fluorene	418	27	6.5%	0.08	35,000	290
Hexachlorobutadiene	560	1	0.2%	530	530	0.86
Indeno(1,2,3-c,d)pyrene	418	3	0.7%	0.07	6.5	0.092

TABLE 5-5
CHEMICALS OF CONCERN IN GROUNDWATER OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Chemical of Concern (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L); (b); (c)
Semi-volatile Organic Compounds						
Naphthalene	818	62	7.6%	0.18	115	62
Phenanthrene	418	44	10.5%	0.01	47,900	(e)
Pyrene	418	84	20.1%	0.02	195,000	180
Total Petroleum Hydrocarbons						
TPH Diesel	1,256	533	42.4%	8	641,000,000	(e)
TPH Gasoline	1,081	310	28.7%	7	58,000	(e)
TPH Motor Oil	627	265	42.3%	15	99,000	(e)
TPH Recoverable	197	23	11.7%	500	19,000	(e)
PCBs, Pesticides, and Herbicides						
Aldrin	119	12	10.1%	0.01	120	0.004
Alpha BHC	115	2	1.7%	0.01	0.01	(e)
Dieldrin	119	31	26.1%	0.01	180	0.0042
Endrin ketone	12	2	16.7%	0.02	0.02	(e)
Heptachlor	119	2	1.7%	0.01	0.01	0.01
4,4'-DDD	119	3	2.5%	0.03	230	0.28
4,4'-DDE	113	1	0.9%	12	12	0.2
4,4'-DDT	119	5	4.2%	0.02	360	0.2
Alpha endosulfan (Endosulfan I)	82	1	1.2%	0.01	0.01	220
Endosulfan sulfate	115	1	0.9%	0.73	0.73	220
Endrin	115	8	7.0%	0.04	0.1	2
Gamma BHC (Lindane)	119	1	0.8%	0.01	0.01	0.2

TABLE 5-5
CHEMICALS OF CONCERN IN GROUNDWATER OUTSIDE FORMER ORP/BUILDING 1 AREA
Oakland Army Base, Oakland, California

Notes:

(a) Screening to identify chemicals of concern performed on electronic database provided by IT Corporation on 5 March 2002. Refer to text of RAP for methodology employed to identify chemicals of concern.

(b) Federal or State of California Maximum Contaminant Level ("MCL").

(c) U.S. EPA Region IX Preliminary Remediation Goal for tap water ("twPRG") where no MCL is available.

(d) All unfiltered and filtered groundwater metal data were kept in the COC database for purposes of identifying chemicals to be retained as COCs. However, summary statistics on metal concentrations in groundwater were not calculated because such statistics are not representative of dissolved concentrations due to artificially high concentrations of metals measured in unfiltered groundwater samples with excessive turbidity.

(e) No MCL or twPRG are available for compound.

TABLE 5-6
CHEMICALS IN SOIL ELIMINATED AS A RESULT OF CHEMICAL OF CONCERN SCREENING
Oakland Army Base, Oakland, California

Chemical (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg)
Former ORP / Building 1 Area					
1,2,4-trichlorobenzene	72	1	1.4%	0.00584	646
2-hexanone	46	2	4.3%	0.009	(b)
Chloroform	46	1	2.2%	0.01	0.24
Trichlorofluoromethane	46	1	2.2%	0.0021	386
Vinyl acetate	46	1	2.2%	6	426
Outside Former ORP / Building 1 Area					
1,1,1-trichloroethane	524	1	0.2%	0.00233	635
1,2,3,4,6,7,8-heptachlorodibenzofuran	2	1	50.0%	0.0000108	0.000004
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	2	2	100.0%	0.000057	0.000004
1,2,3,4,7,8,9-heptachlorodibenzofuran	2	1	50.0%	0.00000061	0.000004
1,2,3,4,7,8-hexachlorodibenzofuran	2	1	50.0%	0.0000011	0.000004
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	2	1	50.0%	0.00000032	0.000078
1,2,3,6,7,8-hexachlorodibenzofuran	2	1	50.0%	0.000001	0.000004
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	2	1	50.0%	0.0000015	0.000004
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	2	1	50.0%	0.00000099	0.000004
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	2	1	50.0%	0.00000036	0.000004
1,2,3-trichlorobenzene	352	2	0.6%	0.00245	(b)
1,2,4-trichlorobenzene	368	3	0.8%	0.0046	646
1,2-dichlorobenzene	801	6	0.7%	0.69	370
1,3-dichlorobenzene	776	2	0.3%	0.0038	13
1,4-dichlorobenzene	776	6	0.8%	0.42	3.4
2,3,4,6,7,8-hexachlorodibenzofuran	2	1	50.0%	0.0000019	0.000004
2,3,4,7,8-pentachlorodibenzofuran	2	1	50.0%	0.0000008	0.000004
2,3,7,8-tetrachlorodibenzofuran	2	1	50.0%	0.0000012	0.000004
2,3,7,8-tetrachlorodibenzo-p-dioxin	2	1	50.0%	0.0000017	0.000004

TABLE 5-6
CHEMICALS IN SOIL ELIMINATED AS A RESULT OF CHEMICAL OF CONCERN SCREENING
Oakland Army Base, Oakland, California

Chemical (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg)
Outside Former ORP / Building 1 Area					
2-chlorotoluene	226	1	0.4%	0.15	158
2-hexanone	450	1	0.2%	0.005	(b)
2-methylnaphthalene	141	6	4.3%	0.728	(b)
2-nitroaniline	141	1	0.7%	0.019	3.5
4-chlorotoluene	226	1	0.4%	0.00095	(b)
Bromobenzene	341	1	0.3%	0.00073	28
Carbazole	34	1	2.9%	0.7	24
Chlorobenzene	659	10	1.5%	0.97	152
Dibenzofuran	141	5	3.5%	48	291
Octachlorodibenzofuran	2	1	50.0%	0.0000267	0.000004
Octachlorodibenzo-p-dioxin	2	2	100.0%	0.000353	0.000004
Phenol	142	2	1.4%	0.36	36662
Styrene	450	1	0.2%	0.0051	1,700
Vinyl acetate	354	3	0.8%	0.0109	426

Notes:

(a) Chemicals included in this table were eliminated as chemicals of concern because the detection frequency was less than 5%, the maximum detected concentrations were less than U.S. EPA Region IX Preliminary Remediation Goals ("PRGs") for residential land use, and chemicals were not believed to be plausibly associated with chemical releases at the OARB.

(b) No residential PRG is available for compound.

TABLE 5-7
CHEMICALS IN GROUNDWATER ELIMINATED AS A RESULT OF CHEMICAL OF CONCERN SCREENING
Oakland Army Base, Oakland, California

Chemical (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L)
Former ORP / Building 1 Area					
1,3-dichlorobenzene	23	1	4.3%	0.6	6
1,4-dichlorobenzene	23	1	4.3%	0.5	5
Outside Former ORP / Building 1 Area					
1,1,1-trichloroethane	777	1	0.1%	0.9	200
1,1,2-trichloro-1,2,2-trifluoroethane	518	9	1.7%	3.3	1,200
1,2,3-trichlorobenzene	514	4	0.8%	0.5	(b)
1,2-dichlorobenzene	1,030	22	2.1%	35.5	600
1,2-dichloropropane	715	14	2.0%	2.7	5
1,3-dichlorobenzene	1,013	4	0.4%	3	6
1,4-dichlorobenzene	1,009	12	1.2%	2.8	5
2-chlorophenol	103	1	1.0%	7.5	30
2-chlorotoluene	444	1	0.2%	0.08	120
2-hexanone	610	4	0.7%	17	(b)
2-methylnaphthalene	101	2	2.0%	0.8	(b)
4-chloro-3-methylphenol	103	1	1.0%	5.9	(b)
4-nitrophenol	103	1	1.0%	27	290
Benzoic acid	93	2	2.2%	1.5	150,000
Benzyl alcohol	93	1	1.1%	5.4	11,000
Benzylbutylphthalate	110	2	1.8%	20	7,300
Carbon disulfide	605	28	4.6%	29	1,000
Chlorobenzene	909	13	1.4%	60	110
Chloromethane	649	10	1.5%	1.09	2
Diethylphthalate	103	1	1.0%	9.52	29,000
Methyl ethyl ketone (2-butanone)	591	7	1.2%	12	1,900
Methyl isobutyl ketone	610	14	2.3%	0.87	160

TABLE 5-7
CHEMICALS IN GROUNDWATER ELIMINATED AS A RESULT OF CHEMICAL OF CONCERN SCREENING
Oakland Army Base, Oakland, California

Chemical (a)	Samples Analyzed	Samples Detected	Detection Frequency (%)	Maximum Detected Concentration (µg/L)	MCL or twPRG (µg/L)
Outside Former ORP / Building 1 Area					
Phenol	103	2	1.9%	34	22,000
Styrene	610	16	2.6%	0.14	100
Vinyl acetate	497	3	0.6%	8	410

Notes:

(a) Chemicals included in this table were eliminated as chemicals of concern because the detection frequency was less than 5%, the maximum detected concentrations were less than federal or State of California Maximum Contaminant Levels ("MCLs") or U.S. EPA Region IX Preliminary Remediation Goals for tap water ("twPRGs"), if no MCLs have been promulgated, and chemicals were not believed to be plausibly associated with chemical releases at the OARB.

(b) No MCL or twPRG are available for compound.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
Chemical-Specific ARARs and TBCs				
• RWQCB, San Francisco Bay Region, Water Quality Control Plan ("Basin Plan") - Chapter 3	Porter-Cologne Water Quality Control Act promulgated under California Water Code.	See appropriate sections of the Basin Plan listed below.	Locations for appropriate sections of the Basin Plan are listed below.	The Basin Plan identifies beneficial water uses in the San Francisco Bay Area. Chapter 3 of the Basin Plan sets forth water quality objectives for surface waters and groundwaters.
--Pages 3-5 to 3-7: Objectives for Groundwaters	Basin Plan, pp. 3-5 to 3-7.	applicable, chemical-specific	All OBRA locations.	Page 3-6 of the Basin Plan states that at a minimum, groundwaters designated for use as domestic or municipal supply shall not contain concentrations of organic and inorganic chemical constituents in excess of contaminant levels set forth in Table 3-5 of the Basin Plan.
• California Toxics Rule	40 CFR §131.38(b)(1), (2).	applicable, chemical-specific	All OBRA locations.	The final rule, Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California, "California Toxics Rule," 65 Fed. Reg. 31682 (May 18, 2000) sets forth freshwater and saltwater criterion maximum concentrations and criterion continuous concentrations for a number of metals and chemical compounds. These include arsenic, chromium (III), chromium (VI), copper, cyanide, lead, zinc, carbon tetrachloride, asbestos, and PCBs. See Table, 65 Fed. Reg. at 31712-31715. 40 CFR § 131.38(b)(1). These standards may apply to any impacted groundwater at OARB locations. The enforcement of the federal rule was delegated to the RWQCB.
• Toxic Substances Control Act	15 USC §§ 2602, 2605(e) (regulation of PCBs); 40 CFR 761.1-761.3 (definitions) & Subparts C (§§ 761.40-.45) (marking of PCBs and PCB items), D (§§ 761.50-.79) (storage and disposal of PCBs), G (§§ 761.120-.135) (PCB spill cleanup policy), J & K (§§ 761.180-.193, 202-.218) (PCB record keeping, monitoring and reports), N-R (§§ 761.260-.359) (sampling and analysis of PCB waste).	relevant and appropriate, chemical specific to be considered, chemical-specific (Subpart G spill cleanup standards)	Locations with PCBs.	TSCA regulates the use and disposal of various chemicals, including PCBs. Subpart D of 40 CFR Part 761 outlines disposal and cleanup procedures for "PCB remediation waste" (i.e. waste with a PCB concentration of at least 50 ppm) [40 CFR §§ 761.60-.61] and prohibits the unpermitted discharge of PCBs to navigable waters or a treatment works at more than 3 ppb concentration [id. § 761.50(a)(3)]. Certain PCB remediation waste in soil must be cleaned up and disposed of in accordance with Section 761.61. Certain liquid PCB remediation waste must be incinerated or otherwise disposed of in accordance with Section 761.60(a) or (e) [id. § 761.61(b)]. Subpart G establishes standards for cleanup of certain PCB spills of at least 50 ppm concentration occurring after May 4, 1987. Subparts J and K impose notification and reporting requirements under specified circumstances on facilities using or disposing PCBs. TSCA also contains specified requirements for labeling of containers and equipment with PCB-containing materials, and of transport vehicles carrying a certain amount of liquid PCBs (id. § 761.40).

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
• OARB Fuel Storage Tank Sites Cleanup Levels, IT Corporation, Corrective Action Plan ("CAP") for Petroleum Tank Sites, February 2000.	Porter-Cologne Water Quality Control Act promulgated under California Water Code.	to be considered, chemical-specific	OBRA locations with petroleum hydrocarbons.	The Corrective Action Plan presents cleanup levels for petroleum (gasoline and fuel oil) locations at the OARB. Soil and groundwater cleanup levels are presented. The CAIR states that the RWQCB approved the cleanup levels in the CAP. The RWQCB has accepted values within this TPH goal for tank site closures completed at OARB.
• Oakland Urban Land Redevelopment Program	Guidance Document prepared by the City of Oakland Public Works Agency, January 2000.	to be considered, chemical-specific	All OBRA locations.	The Oakland Urban Land Redevelopment Program guidance document was prepared by the City of Oakland Public Works Agency to assist in the cleanup and redevelopment of contaminated property by applying risk-based corrective action at Oakland locations.
• RWQCB Risk-based Screening Levels ("RBSLs")	Porter-Cologne Water Quality Control Act promulgated under California Water Code.	to be considered, chemical-specific	All OBRA locations.	The RWQCB prepared the RBSLs to assist in the evaluation of chemical risks at a site. RBSLs are not cleanup levels. RBSLs can be used as cleanup levels if site-specific cleanup levels are not available.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
Location-Specific ARARs and TBCs				
• RWQCB, San Francisco Bay Region, Water Quality Control Plan ("Basin Plan") - Chapter 4	Porter-Cologne Water Quality Control Act promulgated under California Water Code.	See appropriate sections of the Basin Plan listed below.	Locations for appropriate sections of the Basin Plan are listed below.	Chapter 4 of the Basin Plan sets forth discharge prohibitions throughout the San Francisco Bay region. The discharge prohibitions apply to groundwater at certain OARB locations, including the potential discharge of contaminated groundwater into clean groundwater.
--Pages 4-49 to 4-51, Wetlands Protection and Management.	Basin Plan, pp. 4-49 to 4-51.	applicable, location-specific	Off-site area east of Building 991	The Basin Plan reaffirms the goal of the California Wetlands Conservation Policy of ensuring no overall net loss of wetlands.
• SWRCB Resolution No. 88-63	Authority: Porter-Cologne Water Quality Control Act promulgated under California Water Code.	applicable, location-specific	All areas at OARB locations for which groundwater data are available.	The resolution states that all surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply, unless the surface or groundwaters contain total dissolved solids in excess of 3,000 mg/L, the waters contain high levels of contamination, or the water source does not provide sufficient water to supply a well capable of producing 200 gallons per day.
• National Historic Preservation Act	16 USC §§ 470-470x-6; 36 CFR §§ 800.1-.16, 60.2 (effect of listing in National Register), 65.2 (effect of designation as National Historic Landmark), 68.1-.4 (Dept. of Interior standards for historic property projects assisted by the National Historic Preservation Fund).	applicable, location-specific	Applicable to portions of the OARB that are designated in the National Register as an historic landmark.	Under Section 106 of the NHPA, federal agencies and departments that have authority over proposed federal/federally-assisted undertakings affecting historical properties must take into account the effect of the undertakings on the National Historic Landmark ("NHL") (the "Section 106 Process"), and must afford the Advisory Council on Historic Preservation an opportunity to comment on those undertakings (16 USC § 470f; 36 CFR §§ 800.1-800.16). Federal agencies also must take steps to preserve historic properties "owned or controlled by such agency." (16 USC § 470h-2). In addition, federal agencies must ensure that their contractors and employees meet professional preservation standards in dealing with historical properties (16 USC § 470h-4). The U.S. Army's action at the OARB—disposal and transfer of government property—is a federal undertaking. The Army has completed the NHPA consultation process in connection with its Environmental Impact Statement ("EIS") supporting transfer of the base to OBRA.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
• Archeological and Historic Preservation Act	16 USC §§ 469-469c-2; 43 CFR §§ 7.1-.37 (Dept. of Interior regulations for protection of archeological and historic resources).	applicable, location-specific	Applicable to areas of the OARB in which the federal agency's construction or other licensed project may cause irreparable loss of historical or archeological data.	AHPA requires federal agencies, prior to engaging in activities that could cause irreparable loss of scientific, prehistorical, historical, or archeological data, to notify the Secretary of the Interior of the threatened data and the proposed activities, and to preserve the data or request that the Secretary do so (16 USC § 469a-1(a)). The Department of Interior then must conduct a survey and recovery efforts (or cause them to be conducted) if it finds that the data is significant and may be irrevocably lost without such action (16 USC § 469a-2). Department of Interior regulations at 43 CFR Sections 7.1-.37 support both AHPA and ARPA, and are discussed in more detail below.
• Archeological Resources Protection Act	16 USC §§ 470aa-470mm; 43 CFR §§ 7.1-.37 (Dept. of Interior regulations for protection of archeological and historic resources).	applicable, location-specific	Potentially all OARB locations. The Army's completed EIS process, and its completed consultation with the State Historic Preservation Officer, has verified there are no archeological resources at OARB.	ARPA prohibits excavation of, damage to, or destruction of archeological resources on public lands without a permit issued by the federal land manager (16 USC §§ 470cc(a), 470ee(a)), although no permit is required if the activities in question take place under another permit, license or entitlement for use, and the activities are exclusively for purposes other than the excavation and removal of archeological resources (even if there is incidental disturbance of archeological resources) (43 CFR § 7.5(b)(1)). ARPA requires the permittee to be qualified in archeological methods and to turn over all archeological resources to a scientific or educational institution (id. §§ 7.6, 7.8, 7.9). All archeological resources collected on public lands remain the property of the United States (id. § 7.13), and information regarding the nature or location of the resources may not be made public (id. § 7.18). ARPA also requires notification to Native American tribes if the locations affected have religious or cultural importance to that tribe (id. § 7.7).
• Native American Graves Protection and Repatriation Act ("NAGPRA")	25 USC §§ 3001-3013; 43 CFR §§10.1-.17	applicable, location-specific	Potentially all OARB locations.	NAGPRA establishes a system for determining ownership and proper disposal/removal of Native American cultural items discovered on Federal lands (§ 3002) , and requires inventorying and identification of those items (§§ 3003-3004). Such items must be returned to the relevant tribe, if possible (§ 3005). The federal agency also must conduct certain consultation with the affected tribe, if applicable (43 CFR § 10.5).

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
• Federal Coastal Zone Management Act; California Gov. Code, title 7.2 (including McAteer-Petris Act); San Francisco Bay Conservation and Development Commission's ("BCDC") San Francisco Bay Plan.	16 USC §§ 1453, 1456; Cal. Gov. Code §§ 66602.1, 66605, 66632; Code Cal. Code Regs., title. 14 §§ 10300-10316; BCDC's San Francisco Bay Plan's Water Quality Policies (pp. 10-11), Recreation Policies (pp. 32-35), Public Access Policies (pp. 36-37).	applicable, location-specific	Certain OARB locations within the jurisdiction of the BCDC.	Remedial actions performed in areas under the jurisdiction of BCDC (e.g., within 100 feet of the Bay) must comply with the CZMA and BCDC's San Francisco Bay Plan. Activities that place fill, extract materials, or make any substantial change in use of any water, land or structure within BCDC's jurisdiction require a permit. BCDC's policies include: protecting and increasing wetlands, maintenance of Bay water quality, protecting the Bay through erosion control, minimizing the impact of polluted runoff from projects, increasing recreational opportunities adjacent to the Bay, and providing maximum public access to the Bay. Cal. Gov. Code § 6602.1 states that if development is proposed for salt ponds and managed wetlands, the project should retain as much water surface area as consistent with the project. Section 66605 limits filling the San Francisco Bay.
• Migratory Bird Treaty Act	16 USC §§ 703-708; 50 CFR §§ 10.12, 10.13.	applicable, location-specific	Certain OARB locations with trees in which birds nest.	The Migratory Bird Treaty Act prohibits the taking of migratory birds, their nests and their eggs, unless permitted by the Secretary of the Interior.
• Amended Reuse Plan	*Amended Draft Final Reuse Plan for the Oakland Army Base,* OBRA, 23 July 2001.	to be considered, location-specific	All OARB locations.	The Amended Reuse Plan describes the intended redevelopment of the OARB. Remedial actions implemented at the base should be compatible with planned land uses in this document.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
Action-Specific ARARs and TBCs				
• Basin Plan - Chapter 4	Porter-Cologne Water Quality Control Act promulgated under California Water Code.	See appropriate sections of the Basin Plan listed below.	Locations for appropriate sections of the Basin Plan are listed below.	Chapter 4 of the Basin Plan sets forth discharge prohibitions throughout the San Francisco Bay region.
--Pages 4-8 to 4-11: Effluent limitations	Basin Plan, pp. 4-8 to 4-11, 4-13 to 4-14.	applicable, action-specific	For alternatives at locations that include groundwater, dewatering, or construction stormwater discharges.	This is an ARAR for alternatives involving a discharge. Pages 4-8 to 4-11 set forth effluent limitations for discharges to ocean waters and discharges to the San Francisco Bay. Pages 4-1 to 4-14 set forth requirements for the implementation of effluent limitations. In addition, pages 4-14 to 4-15 of the Basin Plan affirm that the Regional Board regulates construction stormwater discharges through NPDES permits and requires the use of controls to reduce pollutants in stormwater.
--Pages 4-17 to 4-18: Discharge of Treated Groundwater. Table 4-1; Discharge Prohibitions.	Basin Plan, pp. 4-17 to 4-18; Table 4-1.	applicable, action-specific	Locations with potential discharge of treated groundwater	Remediation efforts at OARB locations may include groundwater extraction, and thus the need for proper disposal of treated groundwater. The Basin Plan requires the discharger to minimize the discharge of toxic substances. Table 4-1 more broadly describes discharge prohibitions, e.g., with respect to toxic substances, solid wastes, silt, sediments, oil, and petroleum byproducts. Page 4-17 of the Basin Plan refers to SWRCB Resolution No. 88-160, Disposal of Extracted Groundwater from Clean-up Projects, which urges dischargers of groundwater extracted from site clean-up projects to reclaim their effluent. It states that when reclamation is not feasible, discharges must be piped to a municipal treatment plant. If neither reclamation nor discharge to a municipal plant is feasible, the Regional Board will issue NPDES permits authorizing discharge from these sites. Page 4-32 states that an NPDES permit will be required for the discharge of stormwater from construction activities involving disturbance of five acres or greater total land area or that are part of a larger common plan of development that disturbs greater than five acres of total land area. Pages 4-40 to 4-41 state that the Regional Board may impose further conditions, restrictions, or limitations on waste disposal or other activities that might degrade water quality. Pages 4-58 to 4-59 discuss the Regional Board's strategies for managing the cleanup of polluted sites, including the setting of groundwater and soil clean-up levels.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
• SWRCB Resolution No. 68-16	Authority: Porter-Cologne Water Quality Control Act promulgated under California Water Code.	applicable, action-specific	Locations with groundwater discharge	This resolution, the Antidegradation policy, implements the requirement contained in 40 CFR § 131.12 that existing instream water uses and the level of water quality necessary to protect existing uses be maintained and protected. The Antidegradation policy applies to both surface and groundwater. It may apply to cleanup activities that lead to discharge of pollutants into State waters, e.g., the San Francisco Bay, including groundwater. Under this resolution, discharge of contaminated groundwater is not permitted to high quality groundwater, unless it is in the public interest to allow such a discharge.
• SWRCB Resolution No. 92-49	Authority: Porter-Cologne Water Quality Control Act promulgated under California Water Code.	applicable, action-specific	OARB locations where groundwater impacts are identified	Resolution No. 92-49 establishes policies and procedures for investigating and remediating chemical releases that affect or threaten water quality. In particular, it sets forth procedures that the Regional Water Board shall apply in determining whether a person shall be required to investigate a discharge, or to clean up waste and abate the effects of a discharge under Water Code Section 13304, and the procedures the Regional Water Board shall follow in reviewing investigative and cleanup and abatement proposals.
• EBMUD Sanitary Sewer Discharge Limitations	EBMUD Ordinance No. 311. Authority: Public Utilities Code of the State of California, Division 6	relevant and appropriate, action-specific	Locations where remediation activities will involve discharge of contaminated groundwater or wastewater from dewatering to the sewer; all locations where groundwater monitoring or testing is part of the remedy.	EBMUD rules, regulations, and ordinances prohibit the discharge of storm, drainage, and groundwater to community sewer systems. The maximum strength of wastewater that can be discharged to the community sewer is identified in the ordinance. The ordinance allows EBMUD to enter into an agreement under "unusual conditions" that compels special terms and conditions and charges for the interception, treatment, and disposal of wastewater by EBMUD. A site-specific permit is typically required for such discharges.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
• Hazardous Waste Requirements	Cal. Health & Safety Code §§ 25100-25249, 25250-25250.26, 25260-25929; 22 CCR §§ 66260.1-68500.35 (standards for management of hazardous waste). Federal statutes may apply to areas not covered by state program, or where incorporated by reference [see 42 USC §§ 6901-6991i; 40 CFR Parts 260-282; 49 CFR Parts 172, 173, 178, 179 (transportation)].	relevant and appropriate, action-specific	Specific locations with action-specific regulatory requirements are identified in the rows below.	California's hazardous waste control laws and regulations have been enacted to function in lieu of federal RCRA pursuant to 42 USC § 6926. Health & Safety (H&S) Code Sections 25110 to 25124 contain definitions of terms (e.g. "waste," "hazardous waste," "hazardous waste facility") used generally throughout the statutes and regulations. The term "hazardous waste" includes, but is not limited to, any substance qualifying as a "hazardous waste" under RCRA. See H&S Code §§ 25117(b).
--Generation, Transport and Disposal regulations	Cal. Health & Safety Code §§ 25100-25166.5, 25179.1-.12 (land disposal restrictions ("LDRs")), 25244-25244.24 (waste reduction and recycling); 22 CCR §§ 66260.10-66262.41, 66264.1-.172, 66265.16-.199; 66268.10-.44, .105-.113 (LDRs + treatment standards); 49 CFR Parts 172, 173, 178, 179 (transportation) [incorporated by reference]	relevant and appropriate, action-specific	Relevant to any location where remedial action results in generation, transport, or disposal of hazardous wastes.	Generators of hazardous waste must observe certain requirements in accumulating, storing, marking and treating the waste while on-site, and in preparing and labeling the waste for transport and disposal off-site. (H&S Code §§ 25123.3 (accumulation); 25123.5 & 25201 (treatment); 25160-25166.5 (transport), 25244.4; 22 CCR §§ 66260.200; 66262.10-.41; 66264.1-.172; 66265.170-.177 (container storage), .190-.199 (tank storage)). Persons responsible for handling and transporting waste must receive appropriate training, and contingency/emergency planning and procedures must be in place (22 CCR §§ 66262.34; 66265.16, .30-.37, .50-.56). Required records must be kept (22 CCR 66262.40). These requirements may be relevant and appropriate to any future generation of hazardous wastes through remediation activities at the OARB (e.g. during drilling and excavating), including manifesting and transporting those wastes off site (22 CCR §§ 66262.10-66262.47).

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
Hazardous Waste Requirements (contd) --Corrective Action Management Units ("CAMU")	22 CCR §§ 66264.552	relevant and appropriate, action-specific	Former Oil Reclaiming Plant ("ORP") near Building 1	22 CCR § 66264.552 identifies regulations regarding the on-site placement of remediation waste in a designated CAMU. Placement of remediation wastes within a CAMU does not constitute land disposal. CAMU designation would require DTSC and US EPA review and approval. Site-specific closure requirements are developed for each CAMU.
• Solid (Non-Hazardous) Waste Requirements	Cal. Pub. Res. Code §§ 40000-40201, 43000-44820; 27 CCR §§ 20005-22278	relevant and appropriate, action-specific.	Boiler Debris near Building 99, and potentially other locations.	The regulations require owners and operators of solid (non-hazardous) waste management units (e.g. landfills) that were operating or had received permits for construction or operation on or before November 27, 1984 (see 27 CCR § 20080(d)) to take certain actions during closure or post-closure maintenance of those units (see §§ 20950-21420). The solid waste management, closure and post-closure maintenance regulations are not applicable to the solid waste landfills and other solid waste management units at the OARB because these ceased to operate prior to November 1984. Requirements governing closure and post closure of solid waste management units may be relevant and appropriate to the closure and remediation/excavation of all landfills and other waste management units.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

ARAR or TBC	Citation or Authority	Type	Locations (b)	Description
• Federal Clean Air Act, certain Bay Area Air Quality Management District ("BAAQMD") Regulations	BAAQMD Regulations	Potential applicability is identified in the following rows.	Specific locations with action-specific regulatory requirements are identified in the following rows.	Implementation of Federal Clean Air Act requirements has been delegated, in part, to California. The BAAQMD is the local implementing agency. Where BAAQMD requirements have been incorporated into the State Implementation Plan ("SIP") and approved by EPA, they are federally-enforceable. Where BAAQMD requirements have not been incorporated into the SIP and approved by EPA, they are not federally-enforceable. Several BAAQMD rules and regulations regarding remedial actions are discussed below.
-- Air Requirements	BAAQMD Regulation 6	relevant and appropriate, action-specific	All locations where earthwork or other acts of remediation and removal of soil and debris may occur.	BAAQMD's Regulation 6 limits emissions of particulates (Regulation 6). Excavation and removal of material during remediation activities may result in emissions of particulates. Regulation 6 is not SIP-approved and is not a federally enforceable requirement.
-- Air Requirements	BAAQMD Regulation 7; Regulation 8, Rule 40; and Regulation 9, Rule 2.	Regulation 7 and Regulation 9, Rule 2, relevant and appropriate, action-specific; Regulation 8, Rule 40 (in a prior form), applicable, action-specific	ORP/Building 1 area	Certain BAAQMD regulations limit emissions of pollutants, e.g., odorous substances (Regulation 7), organic compounds (Regulation 8, Rule 40), and hydrogen sulfide (Regulation 9, Rule 2). Excavation and removal of material from landfills may result in emissions of these pollutants. Maintenance of landfills left in place (possibly Landfill E) may also result in such emissions. Regulations 7, and 9, Rule 2, are not SIP-approved. Regulation 8, Rule 40, was approved into the SIP on December 14, 1997 (as amended on June 15, 1994). The current District version of Regulation 8, Rule 40, as amended on December 15, 1999, was submitted to EPA for approval into the SIP on March 28, 2000.
-- Air Requirements	BAAQMD Regulation 8, Rule 15	relevant and appropriate, action-specific	All OARB locations where remediation activities include asphaltic paving.	BAAQMD Regulation 8 (Organic Compounds), Rule 15 (Emulsified and Liquid Asphalts), prohibits the use of certain types of liquid and emulsified asphalts (those that would emit relatively large amounts of organic compounds). The Trust may need to consider use of asphalts not prohibited by this rule. This rule was approved into the SIP on March 22, 1995, as amended by the BAAQMD on June 1, 1994.

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (a)

Oakland Army Base, Oakland, California

Notes:

(a) Abbreviations used in this table are as follows:

AHPA	Archeological and Historic Preservation Act
ARAR	Applicable or Relevant and Appropriate Requirement
ARPA	Archeological Resources Protection Act
BAAQMD	Bay Area Air Quality Management District
BCDC	San Francisco Bay Conservation and Development Commission
CAIR	Corrective Action Implementation Report
CAP	Corrective Action Plan
CAMU	Corrective Action Management Unit
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of concern
CTR	California Toxics Rule
CZMA	Coastal Zone Management Act
EIS	Environmental Impact Statement
H&S	Health and Safety
LDR	Land Disposal Restrictions
NAGPRA	Native American Graves Protection and Repatriation Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
OARB	Oakland Army Base
OBRA	Oakland Base Reuse Authority
ORP	Oil Reclaiming Plant
OSWER	Office of Solid Waste and Emergency Response
PCBs	Polychlorinated biphenyls
RBSL	Risk-based Screening Level
RCRA	Resource Conservation and Recovery Act
RWQCB	California Environmental Protection Agency, Regional Water Quality Control Board, San Francisco Bay Region
SIP	State Implementation Plan
SWRCB	California Environmental Protection Agency, State Water Resources Control Board
TBC	To-Be-Considered
TSCA	Toxic Substances Control Act
U.S. EPA	United States Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
USC	United States Code

(b) Locations for remote staging areas will be identified prior to remedial activities. Remote staging areas will have similar action- and chemical-specific ARARs and TBCs as the primary remedial site. Location-specific ARARs and TBCs may be more or less stringent, depending on the location of the staging area.

TABLE 6-2
NUMERIC VALUES OF POTENTIAL CHEMICAL-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Clean Water Act					Toxic Substances Control Act (mg/kg); (d)
	RWQCB Basin Plan Surface Water Quality Objectives		California Toxics Rule			
	Salinity Greater than 5 parts-per-thousand (µg/L); (b)	Salinity Less than 5 parts-per-thousand (µg/L); (b)	Freshwater (µg/L); (c)	Saltwater (µg/L); (c)	Human Health Risk (µg/L); (c)	
Metals						
Antimony	-- (e)	--	--	--	14	--
Arsenic	36	190	190	36	--	--
Barium	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--
Cadmium	9.3	1.1 (f)	1.1 (f)	9.3	--	--
Chromium, Total	50	11	11	50	--	--
Cobalt	--	--	--	--	--	--
Copper	4.9	11.8 (f)	7	2.9	1,300	--
Lead	5.6	3.2 (f)	3.2 (f)	5.6	--	--
Manganese	--	--	--	--	--	--
Mercury	0.025	0.025 (g)	0.025 (g)	0.025	0.05	--
Molybdenum	--	--	--	--	--	--
Nickel	8.3	158 (f)	56	7.1	610	--
Selenium	--	--	5	71	--	--
Silver	2.3	4.1 (f)	1.2	2.3	--	--
Thallium	--	--	--	--	1.7	--
Vanadium	--	--	--	--	--	--
Zinc	58	106 (f, h)	58	58	--	--
Volatile Organic Compounds						
1,1,2,2-tetrachloroethane	--	--	--	--	0.17	--
1,1,2-trichloroethane	--	--	--	--	0.6	--
1,1-dichloroethane	--	--	--	--	--	--
1,1-dichloroethene	--	--	--	--	0.057	--
1,2,3-trichloropropane	--	--	--	--	--	--
1,2,4-trimethylbenzene	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	0.38	--
1,2-dichloropropane	--	--	--	--	0.52	--
1,3,5-trimethylbenzene	--	--	--	--	--	--
Acetone	--	--	--	--	--	--
Benzene	--	--	--	--	1.2	--
Bromodichloromethane	--	--	--	--	0.56	--
Carbon disulfide	--	--	--	--	--	--
Carbon tetrachloride	--	--	--	--	0.25	--
Chloroform	--	--	--	--	--	--
Dibromochloromethane	--	--	--	--	0.401	--
cis-1,2-dichloroethene	--	--	--	--	--	--
trans-1,2-dichloroethene	--	--	--	--	--	--

TABLE 6-2
NUMERIC VALUES OF POTENTIAL CHEMICAL-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Clean Water Act					Toxic Substances Control Act (mg/kg); (d)
	RWQCB Basin Plan Surface Water Quality Objectives		California Toxics Rule			
	Salinity Greater than 5 parts-per-thousand (µg/L); (b)	Salinity Less than 5 parts-per-thousand (µg/L); (b)	Freshwater (µg/L); (c)	Saltwater (µg/L); (c)	Human Health Risk (µg/L); (c)	
Volatile Organic Compounds						
Ethylbenzene	--	--	--	--	3,100	--
Isopropylbenzene (Cumene)	--	--	--	--	--	--
Methyl ethyl ketone	--	--	--	--	--	--
Methyl isobutyl ketone	--	--	--	--	--	--
Methyl tertiary butyl ether	--	--	--	--	--	--
Methylene chloride	--	--	--	--	4.7	--
n-propylbenzene	--	--	--	--	--	--
p-cymene (p-isopropyltoluene)	--	--	--	--	--	--
n-butylbenzene	--	--	--	--	--	--
sec-butylbenzene	--	--	--	--	--	--
tert-butylbenzene	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	0.8	--
Toluene	--	--	--	--	6,800	--
Trichloroethene	--	--	--	--	2.7	--
Trichlorofluoromethane	--	--	--	--	--	--
Vinyl chloride	--	--	--	--	2	--
Xylenes, Total	--	--	--	--	--	--
Semi-volatile Organic Compounds						
Acenaphthene	--	--	--	--	1,200	--
Acenaphthylene	--	--	--	--	--	--
Anthracene	--	--	--	--	9,600	--
Benzidine	--	--	--	--	0.00012	--
Benzo(a)anthracene	--	--	--	--	0.0044	--
Benzo(a)pyrene	--	--	--	--	0.0044	--
Benzo(b)fluoranthene	--	--	--	--	0.0044	--
Benzo(b,k)fluoranthene	--	--	--	--	0.0044	--
Benzo(g,h,i)perylene	--	--	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--	0.0044	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	1.8	--
Chrysene	--	--	--	--	0.0044	--
Dibenz(a,h)anthracene	--	--	--	--	0.0044	--
Fluoranthene	--	--	--	--	300	--
Fluorene	--	--	--	--	1,300	--
Hexachlorobutadiene	--	--	--	--	0.44	--

TABLE 6-2
NUMERIC VALUES OF POTENTIAL CHEMICAL-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Clean Water Act					Toxic Substances Control Act (mg/kg); (d)
	RWQCB Basin Plan Surface Water Quality Objectives		California Toxics Rule			
	Salinity Greater than 5 parts-per-thousand (µg/L); (b)	Salinity Less than 5 parts-per-thousand (µg/L); (b)	Freshwater (µg/L); (c)	Saltwater (µg/L); (c)	Human Health Risk (µg/L); (c)	
Semi-volatile Organic Compounds						
Indeno(1,2,3-c,d)pyrene	--	--	--	--	0.0044	--
Naphthalene	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--
Pyrene	--	--	--	--	960	--
Total Petroleum Hydrocarbons						
TPH Diesel	--	--	--	--	--	--
TPH Gasoline	--	--	--	--	--	--
TPH Motor Oil	--	--	--	--	--	--
TPH Recoverable	--	--	--	--	--	--
PCBs, Pesticides, and Herbicides						
Aldrin	--	--	--	--	0.00013	--
Alpha BHC	--	--	--	--	0.0039	--
Alpha endosulfan (Endosulfan I)	--	--	0.056	0.0087	110	
Alpha chlordane	--	--	0.0043	0.09	0.00057	--
Gamma chlordane	--	--	0.0043	0.09	0.00057	--
Dieldrin	--	--	0.056	0.0019	0.00014	--
Endosulfan sulfate	--	--	0.056	0.0087	110	--
Endrin	--	--	0.036	0.0023	0.76	--
Endrin aldehyde	--	--	--	--	0.76	--
Endrin ketone	--	--	--	--	--	--
Gamma BHC (Lindane)	--	--	--	--	0.019	--
Heptachlor	--	--	0.0038	0.0036	0.00021	--
Heptachlor epoxide	--	--	0.0038	0.0036	0.0001	--
4,4'-DDD	--	--	--	--	0.00083	--
4,4'-DDE	--	--	--	--	0.00059	--
4,4'-DDT	--	--	0.001	0.001	0.00059	--
Pentachlorophenol	--	--	15	7.9	0.28	--
Toxaphene	--	--	0.0002	0.0002	0.00073	--
PCB-1248 (Aroclor 1248)	--	--	0.014	0.03	0.00017	1, 25
PCB-1260 (Aroclor 1260)	--	--	0.014	0.03	0.00017	1, 25

TABLE 6-2
NUMERIC VALUES OF POTENTIAL CHEMICAL-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Clean Water Act					Toxic Substances Control Act (mg/kg); (d)
	RWQCB Basin Plan Surface Water Quality Objectives		California Toxics Rule			
	Salinity Greater than 5 parts-per-thousand (µg/L); (b)	Salinity Less than 5 parts-per-thousand (µg/L); (b)	Freshwater (µg/L); (c)	Saltwater (µg/L); (c)	Human Health Risk (µg/L); (c)	
Dioxin-like Compounds						
1,2,3,4,6,7,8-heptachlorodibenzofuran	--	--	--	--	--	--
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	--	--	--	--	--	--
1,2,3,4,7,8,9-heptachlorodibenzofuran	--	--	--	--	--	--
1,2,3,4,7,8-hexachlorodibenzofuran	--	--	--	--	--	--
1,2,3,6,7,8-hexachlorodibenzofuran	--	--	--	--	--	--
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	--	--	--	--	--	--
1,2,3,7,8,9-hexachlorodibenzofuran	--	--	--	--	--	--
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	--	--	--	--	--	--
1,2,3,7,8-pentachlorodibenzofuran	--	--	--	--	--	--
1,2,3,7,8-pentachlorodibenzo-p-dioxin	--	--	--	--	--	--
2,3,4,6,7,8-hexachlorodibenzofuran	--	--	--	--	--	--
2,3,4,7,8-pentachlorodibenzofuran	--	--	--	--	--	--
2,3,7,8-tetrachlorodibenzofuran	--	--	--	--	--	--
2,3,7,8-tetrachlorodibenzo-p-dioxin	--	--	--	--	--	--
Heptachlorinated dibenzofurans, Total	--	--	--	--	--	--
Heptachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--	--
Hexachlorinated dibenzofurans, Total	--	--	--	--	--	--
Hexachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--	--
Octachlorodibenzofuran	--	--	--	--	--	--
Octachlorodibenzo-p-dioxin	--	--	--	--	--	--
Pentachlorinated dibenzofurans, Total	--	--	--	--	--	--
Pentachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--	--
Tetrachlorinated dibenzofurans, Total	--	--	--	--	--	--
Tetrachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--	--

TABLE 6-2
NUMERIC VALUES OF POTENTIAL CHEMICAL-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Notes:

(a) Numeric values for chemical-specific ARARs are listed in this table.

μg/L = microgram per liter
mg/kg = milligram per kilogram

(b) Water quality objectives for surface waters are from Table 3-3 and 3-4 of RWQCB *Water Quality Control Plan, San Francisco Bay Basin,* amended 16 April 1997 ("Basin Plan"). Values are for chronic toxicity to aquatic organisms, except for total polycyclic aromatic hydrocarbon criteria which are for protection of human health, based on setting the acceptable lifetime risk for cancer to one-in-a-million (i.e., 0.031 ug/L for salinity greater and less than 5 parts-per-thousand).

(c) California Toxic Rule water quality criteria listed are freshwater and saltwater aquatic toxicity standards, using 4 days of continuous exposure. Human health standards are for one-in-a-million risk for consumption of water and organisms. Values are from 40 CFR §131.38, *Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California.*

(d) TSCA specifies cleanup and disposal provisions for Lead-containing soil, PCB-containing soil, and other types of remediation wastes. Subpart D sets cleanup levels for high occupancy areas (e.g., residence) and low occupancy areas (e.g., unoccupied area outside a building). The cleanup level for unrestricted use of high occupancy areas is 1 mg/kg of PCBs in soil and the cleanup level for unrestricted use of low occupancy areas is 25 mg/kg of PCBs in soil. A PCB cleanup level of 10 mg/kg for high occupancy areas is permissable if the areas impacted by PCBs are capped and accompanied by land use restrictions. Higher cleanup levels for low occupancy areas are also allowed if the areas impacted by PCBs are either fenced or capped and accompanied by land use restrictions. The PCB cleanup level for low occupancy areas is 50 mg/kg for areas that are fenced and 100 mg/kg for areas that are capped and where land use restrictions are placed into effect.

(e) Hyphen indicates no value is provided in the reference.

(f) Value listed is a function of hardness. Value shown is based on a hardness of 100 mg/L as calcium carbonate.

(g) U.S. EPA water quality criterion for mercury is 0.012 μg/L, which is below typical analytical method reporting limit of 0.025 μg/L. An objective of 0.012 μg/L is desirable.

(h) Zinc value revised in 1997 amendments to RWQCB Basin Plan.

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Characteristic Hazardous Waste Classification			Universal Treatment Standards for Underlying Hazardous Constituents (mg/kg or mg/L TCLP); (c)	East Bay Municipal Utility District Discharge Limitations to Sanitary Sewer (mg/L); (d)
	Toxicity Characteristic Leaching Procedure ("TCLP") (mg/L); (b)	Soluble Threshold Limit Concentration ("STLC") (mg/L); (b)	Total Threshold Limit Concentration ("TTLC") (mg/kg); (b)		
Metals					
Antimony	-- (e)	15	500	1.15 (f)	--
Arsenic	5	5	500	5 (f)	2
Barium	100	100	10,000	21 (f)	--
Beryllium	--	0.75	75	1.22 (f)	--
Cadmium	1	1	100	0.11 (f)	1
Chromium, Total	5	5	2,500	0.60 (f)	2
Cobalt	--	80	8,000	--	--
Copper	--	25	2,500 (g)	--	5
Lead	5	5	1,000 (g)	0.75 (f)	2
Manganese	--	--	--	--	--
Mercury	0.2	0.2	20	0.025 (f)	0.05
Molybdenum	--	350	3,500	--	--
Nickel	--	20	2,000 (g)	11 (f)	5
Selenium	1	1	100	5.7 (f)	--
Silver	5	5	500	0.14 (f)	1
Thallium	--	7	700	0.20 (f)	--
Vanadium	--	24	2,400	1.6 (f)	--
Zinc	--	250	5,000	4.3 (f)	5
Volatile Organic Compounds					
1,1,2,2-tetrachloroethane	--	--	--	6.0	--
1,1,2-trichloroethane	--	--	--	6.0	--
1,1-dichloroethane	--	--	--	6.0	--
1,1-dichloroethene	0.7	--	--	6.0	--
1,2,3-trichloropropane	--	--	--	30	--
1,2,4-trimethylbenzene	--	--	--	--	--
1,2-dichloroethane	0.5	--	--	6.0	--
1,2-dichloropropane	--	--	--	18	--
1,3,5-trimethylbenzene	--	--	--	--	--
Acetone	--	--	--	160	--
Benzene	0.5	--	--	10	--
Bromodichloromethane	--	--	--	15	--
Carbon disulfide	--	--	--	4.8 (f)	--
Carbon tetrachloride	0.5	--	--	6.0	--
Chloroform	6.0	--	--	6.0	--
Dibromochloromethane	--	--	--	15	--
cis-1,2-dichloroethene	--	--	--	--	--
trans-1,2-dichloroethene	--	--	--	30	--
Ethylbenzene	--	--	--	10	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Characteristic Hazardous Waste Classification			Universal Treatment Standards for Underlying Hazardous Constituents (mg/kg or mg/L TCLP); (c)	East Bay Municipal Utility District Discharge Limitations to Sanitary Sewer (mg/L); (d)
	Toxicity Characteristic Leaching Procedure ("TCLP") (mg/L); (b)	Soluble Threshold Limit Concentration ("STLC") (mg/L); (b)	Total Threshold Limit Concentration ("TTLC") (mg/kg); (b)		
Volatile Organic Compounds					
Isopropylbenzene (Cumene)	--	--	--	--	--
Methyl ethyl ketone	200	--	--	36	--
Methyl isobutyl ketone	--	--	--	33	--
Methyl tertiary butyl ether	--	--	--	--	--
Methylene chloride	--	--	--	30	--
n-propylbenzene	--	--	--	--	--
p-cymene (p-isopropyltoluene)	--	--	--	--	--
n-butylbenzene	--	--	--	--	--
sec-butylbenzene	--	--	--	--	--
tert-butylbenzene	--	--	--	--	--
Tetrachloroethene	0.7	--	--	6.0	--
Toluene	--	--	--	10	--
Trichloroethene	0.5	204	2,040	6.0	--
Trichlorofluoromethane	--	--	--	30	--
Vinyl chloride	0.2	--	--	6.0	--
Xylenes, Total	--	--	--	30	--
Semi-volatile Organic Compounds					
Acenaphthene	--	--	--	3.4	--
Acenaphthylene	--	--	--	3.4	--
Anthracene	--	--	--	3.4	--
Benzidine	--	--	--	--	--
Benzo(a)anthracene	--	--	--	3.4	--
Benzo(a)pyrene	--	--	--	3.4	--
Benzo(b)fluoranthene	--	--	--	6.8	--
Benzo(b,k)fluoranthene	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	1.8	--
Benzo(k)fluoranthene	--	--	--	6.8	--
Bis(2-ethylhexyl)phthalate	--	--	--	28	--
Chrysene	--	--	--	3.4	--
Dibenz(a,h)anthracene	--	--	--	8.2	--
Fluoranthene	--	--	--	3.4	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Characteristic Hazardous Waste Classification			Universal Treatment Standards for Underlying Hazardous Constituents (mg/kg or mg/L TCLP); (c)	East Bay Municipal Utility District Discharge Limitations to Sanitary Sewer (mg/L); (d)
	Toxicity Characteristic Leaching Procedure ("TCLP") (mg/L); (b)	Soluble Threshold Limit Concentration ("STLC") (mg/L); (b)	Total Threshold Limit Concentration ("TTLC") (mg/kg); (b)		
Semi-volatile Organic Compounds					
Fluorene	--	--	--	3.4	--
Hexachlorobutadiene	--	--	--	5.6	--
Indeno(1,2,3-c,d)pyrene	--	--	--	3.4	--
Naphthalene	--	--	--	5.6	--
Phenanthrene	--	--	--	5.6	--
Pyrene	--	--	--	8.2	--
Total Petroleum Hydrocarbons					
TPH Diesel	--	--	--	--	--
TPH Gasoline	--	--	--	--	--
TPH Motor Oil	--	--	--	--	--
TPH Recoverable	--	--	--	--	--
PCBs, Pesticides, and Herbicides					
Aldrin	--	0.14	1.4	0.066	--
Alpha BHC	--	--	--	0.066	--
Alpha endosulfan (Endosulfan I)	--	--	--	0.066	--
Alpha chlordane	0.03	0.25	2.5	0.26	--
Gamma chlordane	0.03	0.25	2.5	0.26	--
Dieldrin	--	0.8	8	0.13	--
Endosulfan sulfate	--	--	--	0.066	--
Endrin	--	0.02	0.2	0.13	--
Endrin aldehyde	--	--	--	0.13	--
Endrin ketone	--	--	--	--	--
Gamma BHC (Lindane)	0.4	0.4	4	0.066	--
Heptachlor	0.008	0.47	4.7	0.066	--
Heptachlor epoxide	0.008	--	--	0.066	--
4,4'-DDD	--	0.1	1	0.087	--
4,4'-DDE	--	0.1	1	0.087	--
4,4'-DDT	--	0.1	1	0.087	--
Pentachlorophenol	100	1.7	17	7.4	--
Toxaphene	0.5	0.5	5	2.6	--
PCB-1248 (Aroclor 1248)	--	5 (h)	50 (h)	10 (h)	--
PCB-1260 (Aroclor 1260)	--	5 (h)	50 (h)	10 (h)	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Characteristic Hazardous Waste Classification			Universal Treatment Standards for Underlying Hazardous Constituents (mg/kg or mg/L TCLP); (c)	East Bay Municipal Utility District Discharge Limitations to Sanitary Sewer (mg/L); (d)
	Toxicity Characteristic Leaching Procedure ("TCLP") (mg/L); (b)	Soluble Threshold Limit Concentration ("STLC") (mg/L); (b)	Total Threshold Limit Concentration ("TTLC") (mg/kg); (b)		
Dioxin-like Compounds					
1,2,3,4,6,7,8-heptachlorodibenzofuran	--	--	--	0.0025	--
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	--	--	--	0.0025	--
1,2,3,4,7,8,9-heptachlorodibenzofuran	--	--	--	--	--
1,2,3,4,7,8-hexachlorodibenzofuran	--	--	--	--	--
1,2,3,6,7,8-hexachlorodibenzofuran	--	--	--	--	--
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	--	--	--	--	--
1,2,3,7,8,9-hexachlorodibenzofuran	--	--	--	--	--
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	--	--	--	--	--
1,2,3,7,8-pentachlorodibenzofuran	--	--	--	--	--
1,2,3,7,8-pentachlorodibenzo-p-dioxin	--	--	--	--	--
2,3,4,6,7,8-hexachlorodibenzofuran	--	--	--	--	--
2,3,4,7,8-pentachlorodibenzofuran	--	--	--	--	--
2,3,7,8-tetrachlorodibenzofuran	--	--	--	--	--
2,3,7,8-tetrachlorodibenzo-p-dioxin	--	--	--	--	--
Heptachlorinated dibenzofurans, Total	--	--	--	--	--
Heptachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--
Hexachlorinated dibenzofurans, Total	--	--	--	0.001	--
Hexachlorinated dibenzo-p-dioxins, Total	--	--	--	0.001	--
Octachlorodibenzofuran	--	--	--	0.005	--
Octachlorodibenzo-p-dioxin	--	--	--	0.005	--
Pentachlorinated dibenzofurans, Total	--	--	--	0.001	--
Pentachlorinated dibenzo-p-dioxins, Total	--	--	--	0.001	--
Tetrachlorinated dibenzofurans, Total	--	--	--	0.001	--
Tetrachlorinated dibenzo-p-dioxins, Total	--	--	--	0.001	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Non-hazardous Waste Classification				
	Designated Waste			Non-hazardous Solid Waste	
	TCLP Maximum Concentration Permissible (mg/L); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)
Metals					
Antimony	--	15	500	--	--
Arsenic	5	5	500	--	--
Barium	100	100	10,000	--	--
Beryllium	--	0.75	75	--	--
Cadmium	1	1	100	0.05	0.5
Chromium, Total	5	560	2,500	0.5	5
Cobalt	--	80	8,000	--	--
Copper	--	25	2,500 (g)	20	200
Lead	5	5	1,000 (g)	1.5	15
Manganese	--	--	--	--	--
Mercury	0.2	0.2	20	0.02	0.2
Molybdenum	--	350	3,500	--	--
Nickel	--	20	2,000 (g)	1	10
Selenium	1	1	100	--	--
Silver	5	5	500	--	--
Thallium	--	7	700	--	--
Vanadium	--	24	2,400	--	--
Zinc	--	250	5,000	200	2,000
Volatile Organic Compounds					
1,1,2,2-tetrachloroethane	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--
1,1-dichloroethene	--	--	--	--	--
1,2,3-trichloropropane	--	--	--	--	--
1,2,4-trimethylbenzene	--	--	--	--	--
1,2-dichloroethane	0.5	--	--	--	--
1,2-dichloropropane	--	--	--	--	--
1,3,5-trimethylbenzene	--	--	--	--	--
Acetone	--	--	--	--	--
Benzene	0.5	--	10	--	ND (j)
Bromodichloromethane	--	--	--	--	--
Carbon disulfide	--	--	--	--	--
Carbon tetrachloride	0.5	--	10	--	--
Chloroform	6.0	--	--	--	--
Dibromochloromethane	--	--	--	--	--
cis-1,2-dichloroethene	--	--	--	--	--
trans-1,2-dichloroethene	--	--	--	--	--
Ethylbenzene	--	--	--	--	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Non-hazardous Waste Classification				
	Designated Waste			Non-hazardous Solid Waste	
	TCLP Maximum Concentration Permissible (mg/L); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)
Volatile Organic Compounds					
Isopropylbenzene (Cumene)	--	--	--	--	--
Methyl ethyl ketone	200	--	--	--	--
Methyl isobutyl ketone	--	--	--	--	--
Methyl tertiary butyl ether	--	--	--	--	--
Methylene chloride	--	--	--	--	--
n-propylbenzene	--	--	--	--	--
p-cymene (p-isopropyltoluene)	--	--	--	--	--
n-butylbenzene	--	--	--	--	--
sec-butylbenzene	--	--	--	--	--
tert-butylbenzene	--	--	--	--	--
Tetrachloroethene	0.7	--	14	--	--
Toluene	--	--	--	--	ND
Trichloroethene	0.5	204	2,040	--	--
Trichlorofluoromethane	--	--	--	--	--
Vinyl chloride	0.2	--	--	--	--
Xylenes, Total	--	--	--	--	ND
Semi-volatile Organic Compounds					
Acenaphthene	--	--	--	--	--
Acenaphthylene	--	--	--	--	--
Anthracene	--	--	--	--	--
Benzidine	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--
Benzo(b)fluoranthene	--	--	--	--	--
Benzo(b,k)fluoranthene	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--
Chrysene	--	--	--	--	--
Dibenz(a,h)anthracene	--	--	--	--	--
Fluoranthene	--	--	--	--	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Non-hazardous Waste Classification				
	Designated Waste			Non-hazardous Solid Waste	
	TCLP Maximum Concentration Permissible (mg/L); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)
Semi-volatile Organic Compounds					
Fluorene	--	--	--	--	--
Hexachlorobutadiene	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--
Naphthalene	--	--	--	--	--
Phenanthrene	--	--	--	--	--
Pyrene	--	--	--	--	--
Total Petroleum Hydrocarbons					
TPH Diesel	--	--	20,000	--	100
TPH Gasoline	--	--	5,900	--	ND
TPH Motor Oil	--	--	10,000	--	--
TPH Recoverable	--	--	--	--	--
PCBs, Pesticides, and Herbicides					
Aldrin	--	0.14	1.4	--	--
Alpha BHC	--	--	--	--	--
Alpha endosulfan (Endosulfan I)	--	--	--	--	--
Alpha chlordane	0.03	0.25	2.5	--	--
Gamma chlordane	0.03	0.25	2.5	--	--
Dieldrin	--	0.8	8	--	--
Endosulfan sulfate	--	--	--	--	--
Endrin	0.02	0.02	0.2	--	--
Endrin aldehyde	--	--	--	--	--
Endrin ketone	--	--	--	--	--
Gamma BHC (Lindane)	0.4	0.4	4	--	--
Heptachlor	0.008	0.47	4.7	--	--
Heptachlor epoxide	--	--	--	--	--
4,4'-DDD	--	0.1	1	--	--
4,4'-DDE	--	0.1	1	--	--
4,4'-DDT	--	0.1	1	--	--
Pentachlorophenol	100	1.7	17	--	--
Toxaphene	0.5	0.5	5	--	--
PCB-1248 (Aroclor 1248)	--	5 (h)	50 (h)	--	--
PCB-1260 (Aroclor 1260)	--	5 (h)	50 (h)	--	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Non-hazardous Waste Classification				
	Designated Waste			Non-hazardous Solid Waste	
	TCLP Maximum Concentration Permissible (mg/L); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)	STLC Maximum Concentration Permissible (mg/L); (i)	TTLC Maximum Concentration Permissible (mg/kg); (i)
Dioxin-like Compounds					
1,2,3,4,6,7,8-heptachlorodibenzofuran	--	--	--	--	--
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	--	--	--	--	--
1,2,3,4,7,8,9-heptachlorodibenzofuran	--	--	--	--	--
1,2,3,4,7,8-hexachlorodibenzofuran	--	--	--	--	--
1,2,3,6,7,8-hexachlorodibenzofuran	--	--	--	--	--
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	--	--	--	--	--
1,2,3,7,8,9-hexachlorodibenzofuran	--	--	--	--	--
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	--	--	--	--	--
1,2,3,7,8-pentachlorodibenzofuran	--	--	--	--	--
1,2,3,7,8-pentachlorodibenzo-p-dioxin	--	--	--	--	--
2,3,4,6,7,8-hexachlorodibenzofuran	--	--	--	--	--
2,3,4,7,8-pentachlorodibenzofuran	--	--	--	--	--
2,3,7,8-tetrachlorodibenzofuran	--	--	--	--	--
2,3,7,8-tetrachlorodibenzo-p-dioxin	--	--	--	--	--
Heptachlorinated dibenzofurans, Total	--	--	--	--	--
Heptachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--
Hexachlorinated dibenzofurans, Total	--	--	--	--	--
Hexachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--
Octachlorodibenzofuran	--	--	--	--	--
Octachlorodibenzo-p-dioxin	--	--	--	--	--
Pentachlorinated dibenzofurans, Total	--	--	--	--	--
Pentachlorinated dibenzo-p-dioxins, Total	--	--	--	--	--
Tetrachlorinated dibenzofurans, Total	--	--	--	--	--
Tetrachlorinated dibenzo-p-dioxins, Total	--	0.001	0.01	--	--

TABLE 6-3
NUMERIC VALUES OF POTENTIAL ACTION-SPECIFIC ARARs (a)
Oakland Army Base, Oakland, California

Notes:

(a) Numeric values for action-specific ARARs are listed in this table. See Table 6-1 for complete listing and synopses of ARARs and TBCs.

mg/L = milligram per liter
mg/kg = milligram per kilogram

(b) Waste classification criteria are from 22 CCR 66261.24.

(c) Universal treatment standards for underlying hazardous constituents from 40 CFR 268.48(a). Unless otherwise noted, values are in units of mg/kg.

(d) East Bay Municipal Utility District Ordinance 311 states limitations on wastewater discharges. Ordinance No. 311 limits the discharge to the sanitary sewer. The stated values listed in Ordinance 311 may be revised in a site-specific permit.

(e) Hyphen indicates no value is provided in the reference.

(f) Values noted are in units of mg/L as measured in the Toxicity Characteristic Leaching Procedure extract.

(g) Pursuant to HSC §25157.8, additional criteria pertain to the management of lead, copper, or nickel contaminated waste. Waste containing total lead greater than 350 mg/kg, copper greater than 2,500 mg/kg, or nickel greater than 2,000 mg/kg must be disposed at a permitted hazardous waste management facility, unless the waste discharge requirements and solid waste facility permit of a non-hazardous waste management facility specifically allow for the disposal of these types of wastes. HSC §25157.8 remains in effect until 1 July 2006, and as of that date is repealed unless a later statute is enacted that repeals or extends the 1 July 2006 sunset provision.

(h) For PCBs, the value listed is the sum of all PCB isomers, or all Aroclors. For the universal treatment standards for underlying hazardous constituents, the standard is temporarily deferred for soil exhibiting a hazardous characteristic due to D004 through D011 only.

(i) Non-hazardous waste disposal requirements are from Waste Management *Altamont Landfill and Resource Recovery Facility Waste Acceptance Criteria*, revised June 1999. Waste Management operates Class II and Class III waste management units at its Altamont facility. Values listed are specific to Waste Management's Altamont facility. Acceptance of wastes are at the discretion of permitted waste management facility. Consequently, non-hazardous waste disposal requirements may vary by facility.

(j) ND = None Detected. Disposal requirements state that chemical must be at non-detectable concentrations. Analytical method reporting limits are not specified.

TABLE 7-1
NON-CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Chronic Oral Reference Dose (mg/kg-day)	Chronic Inhalation Reference Dose (mg/kg-day)	Potential Health Effect	Reference
Metals				
Antimony	0.0004	--	Longevity, blood glucose	IRIS
Arsenic	0.0003	--	Hyperpigmentation, keratosis	IRIS
Barium	0.07	0.00014	--	IRIS
Beryllium	0.002	0.0000057	Small intestinal lesions	IRIS
Cadmium	0.0005	--	Significant proteinuria	IRIS
Chromium (III)	1.5	--	No effects observed	IRIS
Chromium (VI)	0.003	0.0000023	Nasal septum atrophy	IRIS
Cobalt	0.06	--	--	NCEA
Copper	0.037	--	--	HEAST
Lead	--	--	--	--
Manganese	0.14	0.000014	Central Nervous System effects	IRIS
Mercury	0.000086	0.000086	Hand tremor, memory disturbance	IRIS
Molybdenum	0.005	--	Increased uric acid levels	IRIS
Nickel	0.02	--	Decreased body and organ weights	IRIS
Selenium	0.005	--	Clinical selenosis	IRIS
Silver	0.005	--	Argyria	IRIS
Thallium	0.00007	--	Liver and blood effects	IRIS (b)
Vanadium	0.0070	--	--	HEAST
Zinc	0.3	--	Decreased blood enzyme	IRIS
Volatile Organic Compounds				
1,1,2,2-tetrachloroethane	0.06	--	--	NCEA
1,1,2-trichloroethane	0.004	--	Clinical serum chemistry	IRIS
1,1-dichloroethane	0.1	--	--	HEAST
1,1-dichloroethene	0.009	--	Hepatic lesions	IRIS
1,2,3-trichloropropane	0.006	--	Reduction in red cell mass	IRIS
1,2,4-trimethylbenzene	0.05	0.0017	--	NCEA
1,3,5-trimethylbenzene	0.05	0.0017	--	NCEA
1,2-dichloropropane	--	0.0011	Hyperplasia of the nasal mucosa	IRIS
1,2-dichloroethane	0.03	0.0014	--	NCEA
Acetone	0.1	--	Increased liver and kidney weight	IRIS
Benzene	0.003	0.0017 (c)	--	NCEA
Bromodichloromethane	0.02	--	Renal cytomegaly	IRIS

TABLE 7-1
NON-CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Chronic Oral Reference Dose (mg/kg-day)	Chronic Inhalation Reference Dose (mg/kg-day)	Potential Health Effect	Reference
Volatile Organic Compounds				
Carbon disulfide	0.1	0.2	Fetal toxicity, nervous system	IRIS
Carbon tetrachloride	0.0007	--	Liver lesions	IRIS
Chloroform	0.01	--	Marked fatty cyst formation in liver	IRIS
cis-1,2-dichloroethene	0.01	--	Decreased hemoglobin	HEAST
trans-1,2-dichloroethene	0.02	--	Serum alkaline phosphatase	IRIS
Dibromochloromethane	0.02	--	Hepatic lesions	IRIS
Ethylbenzene	0.1	0.29	Liver and kidney toxicity	IRIS
Isopropylbenzene (cumene)	0.1	0.11	Increased kidney weight	IRIS
Methyl ethyl ketone	0.6	0.29	Decreased fetal birth weight	IRIS
Methyl isobutyl ketone	0.08	--	Increased liver and kidney weight	HEAST
Methyl teriary butyl ether	0.86	0.86	Increased liver and kidney weights	IRIS
Methylene chloride	0.06	0.86	Liver toxicity	IRIS/ HEAST
n-butylbenzene	0.01	--	--	NCEA
n-propylbenzene	0.01	--	--	NCEA
p-cymene (p-isopropyltoluene)	0.1	0.114	Increased kidney weight	IRIS
sec-butylbenzene	0.01	--	--	NCEA
tert-butylbenzene	0.01	--	--	NCEA
Tetrachloroethene	0.01	--	Hepatotoxicity and weight gain	IRIS
Toluene	0.2	0.11	Liver and kidney weight changes	IRIS
Trichloroethene	0.006	--	--	PRG
Trichlorofluoromethane	0.3	--	Survival and histopathology	IRIS
Vinyl chloride	0.003	0.029	Liver cell polymorphism	IRIS
Xylenes, Total	2	--	Hyperactivity	IRIS
Semi-volatile Organic Compounds				
Acenaphthene	0.06	--	Hepatotoxicity	IRIS
Acenaphthylene	--	--	--	--
Anthracene	0.3	--	No observed effects	IRIS
Benzidine	0.003	--	Brain cell vacuolization	IRIS
Benzo(b)anthracene	--	--	--	--
Benzo(b)pyrene	--	--	--	--
Benzo(c)fluoranthene	--	--	--	--
Benzo(b,k)fluoranthene	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--

TABLE 7-1
NON-CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Chronic Oral Reference Dose (mg/kg-day)	Chronic Inhalation Reference Dose (mg/kg-day)	Potential Health Effect	Reference
Semi-volatile Organic Compounds				
Benzo(k)fluoranthene	--	--	--	--
Bis(2-ethylhexyl)phthalate	0.02	--	Increased relative liver weight	IRIS
Chrysene	--	--	--	--
Dibenz(a,h)anthracene	--	--	--	--
Fluoranthene	0.04	--	Nephropathy	IRIS
Fluorene	0.04	--	Decreased red blood cells	IRIS
Hexachlorobutadiene	0.0003	--	--	NCEA
Indeno(1,2,3-c,d)pyrene	--	--	--	--
Naphthalene	0.02	0.00086	Decreased body weight	IRIS
Phenanthrene	0.3	--	--	(d)
Pyrene	0.03	--	Kidney effects	IRIS
Total Petroleum Hydrocarbons				
TPH Diesel	--	--	--	--
TPH Gasoline	--	--	--	--
TPH Motor Oil	--	--	--	--
TPH Recoverable	--	--	--	--
PCBs, Pesticides, and Herbicides				
Aldrin	0.00003	--	Liver toxicity	IRIS
Alpha BHC	0.0003	--	--	(e)
Alpha endosulfan (Endosulfan I)	0.006	--	Reduced body weight	IRIS (f)
Alpha chlordane	0.0005	0.0002	Hepatic necrosis	IRIS (g)
Gamma chlordane	0.0005	0.0002	Hepatic necrosis	IRIS (g)
Dieldrin	0.00005	--	Liver lesions	IRIS
Endosulfan sulfate	0.006	--	Reduced body weight	IRIS (f)
Endrin	0.0003	--	Liver lesions	IRIS
Endrin aldehyde	0.0003	--	--	IRIS (h)
Endrin ketone	0.0003	--	--	IRIS (h)
Gamma BHC (Lindane)	0.0003	--	Liver and kidney toxicity	IRIS
Heptachlor	0.0005	--	Increases liver weight	IRIS
Heptachlor epoxide	0.000013	--	Increased liver-to-body weight	IRIS
4,4'-DDD	0.0005	--	--	(i)

TABLE 7-1
NON-CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Chronic Oral Reference Dose (mg/kg-day)	Chronic Inhalation Reference Dose (mg/kg-day)	Potential Health Effect	Reference
PCBs, Pesticides, and Herbicides				
4,4'-DDE	0.0005	--	--	(i)
4,4'-DDT	0.0005	--	Liver lesions	IRIS
Pentachlorophenol	--	0.03	Liver and kidney pathology	IRIS
Toxaphene	--	--	--	--
PCB-1248 (Aroclor 1248)	--	--	--	--
PCB-1260 (Aroclor 1260)	--	--	--	--
Dioxin-like Compounds				
2,3,7,8-tetrachlorodibenzo-p-dioxin	--	--	--	--

TABLE 7-1
NON-CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Notes:

(a) Abbreviations used in this table are as follows:

4,4'-DDD	1,1-dichloro-2,2-di(4-chlorophenyl)ethane
4,4'-DDE	1,1-dichloro-2,2-bis(4-chlorophenyl)ethane
4,4'-DDT	1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane
HEAST	Health Effects Assessment Summary Table
IRIS	Integrated Risk Information System
NCEA	National Center for Environmental Assessment
OEHHA	Office of Environmental Health Hazard Assessment
PCB	polychlorinated biphenyl

(b) No reference dose for thallium was available in IRIS, HEAST, or from NCEA. Instead, the reference dose for thallium sulfate corrected for the molecular weight difference was used.

(c) The reference dose used for benzene is based on a subchronic inhalation reference dose from NCEA divided by a factor of 10 for conversion to a chronic reference dose.

(d) No reference dose for phenanthrene was available. At the suggestion of U.S. EPA Superfund Technical Support staff, the reference dose for anthracene was used, which is a structurally similar surrogate compound. was used.

(e) No reference dose for alpha BHC was available. The reference dose for gamma BHC was used, which is a structurally similar surrogate compound.

(f) No reference dose for alpha endosulfan and endosulfan sulfate was available. The reference dose for endosulfan was used.

(g) No reference dose for alpha or gamma chlordane was available. The reference dose for chlordane was used.

(h) No reference dose for endrin aldehyde or endrin ketone was available. The reference dose for endrin was used, which is a structurally similar compound.

(i) No reference dose for 4,4'-DDD and 4,4'-DDE was available. At the suggestion of U.S. EPA Superfund Technical Support staff, the reference dose for 4,4'-DDT was used, which is a structurally similar compound.

TABLE 7-2
CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Reference
Metals				
Antimony	--	--	--	--
Arsenic	1.5	12	A	OEHHA
Barium	--	--	--	--
Beryllium	--	8.4	B2	IRIS
Cadmium	0.38	15	B1	IRIS
Chromium (III)	--	--	--	--
Chromium (VI)	0.42	510	A	OEHHA
Cobalt	--	--	--	--
Copper	--	--	D	IRIS
Lead	--	--	--	--
Manganese	--	--	D	IRIS
Mercury	--	--	D	IRIS
Molybdenum	-	-	-	--
Nickel	--	0.91	A	OEHHA
Selenium	--	--	D	IRIS
Silver	--	--	D	IRIS
Thallium	--	--	D	IRIS
Vanadium	--	--	--	--
Zinc	--	--	D	IRIS
Volatile Organic Compounds				
1,1,2,2-tetrachloroethane	0.27	0.2	C	OEHHA
1,1,2-trichloroethane	0.072	0.057	C	OEHHA
1,1-dichloroethane	0.0057	0.0057	C	OEHHA
1,1-dichloroethene	--	--	C	IRIS
1,2,3-trichloropropane	7	--	B2	HEAST
1,2,4-trimethylbenzene	--	--	--	--
1,3,5-trimethylbenzene	--	--	--	--
1,2-dichloropropane	0.036	0.036	--	OEHHA
1,2-dichloroethane	0.047	0.07	B2	OEHHA
Acetone	--	--	--	--
Benzene	0.1	0.1	A	OEHHA
Bromodichloromethane	0.13	0.13	B2	OEHHA

TABLE 7-2
CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Reference
Volatile Organic Compounds				
Carbon disulfide	--	--	--	--
Carbon tetrachloride	0.15	0.15	B2	OEHHA
Chloroform	0.031	0.019	B2	OEHHA
cis-1,2-Dichloroethene	--	--	D	IRIS
trans-1,2-Dichloroethene	--	--	--	--
Dibromochloromethane	0.094	0.094	C	OEHHA
Ethylbenzene	--	--	D	IRIS
Isopropylbenzene (cumene)	--	--	D	IRIS
Methyl ethyl ketone	--	--	D	IRIS
Methyl isobutyl ketone	--	--	--	--
Methyl teriary butyl ether	0.0018	0.0018	-	OEHHA
Methylene chloride	0.014	0.0035	B2	IRIS
n-butylbenzene	--	--	--	--
n-propylbenzene	--	--	--	--
p-cymene (p-isopropyltoluene)	--	--	D	IRIS
sec-butylbenzene	--	--	--	--
tert-butylbenzene	--	--	--	--
Tetrachloroethene	0.051	0.021	C-B2 (NCEA)	OEHHA
Toluene	- (d)	- (d)	D	IRIS
Trichloroethene	0.015	0.01	C-B2 (NCEA)	OEHHA
Trichlorofluoromethane	--	--	--	--
Vinyl chloride	0.27	0.27	A	OEHHA
Xylenes, Total	--	--	D	IRIS
Semi-volatile Organic Compounds				
Acenaphthene	--	--	--	--
Acenaphthylene	--	--	D	IRIS
Anthracene	--	--	D	IRIS
Benzidine	500	500	A	OEHHA
Benzo(a)anthracene	1.2	0.39	B2	OEHHA
Benzo(a)pyrene	12	3.9	B2	OEHHA
Benzo(b)fluoranthene	1.2	0.39	B2	OEHHA
Benzo(b,k)fluoranthene	1.2	0.39	B2	OEHHA
Benzo(g,h,i)perylene	--	--	D	IRIS

TABLE 7-2
CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Reference
Semi-volatile Organic Compounds				
Benzo(k)fluoranthene	1.2	0.39	B2	OEHHA
Bis(2-ethylhexyl)phthalate	0.003	0.0084	B2	OEHHA
Chrysene	0.12	0.039	B2	OEHHA
Dibenz(a,h)anthracene	4.1	4.1	B2	OEHHA
Fluoranthene	--	--	D	IRIS
Fluorene	--	--	D	IRIS
Hexachlorobutadiene	0.078	0.078	C	HEAST
Indeno(1,2,3-c,d)pyrene	1.2	0.39	B2	OEHHA
Naphthalene	--	--	--	--
Phenanthrene	--	--	D	IRIS
Pyrene	--	--	D	IRIS
Total Petroleum Hydrocarbons				
TPH Diesel	--	--	--	--
TPH Gasoline	--	--	--	--
TPH Motor Oil	--	--	--	--
TPH Recoverable	--	--	--	--
PCBs, Pesticides, and Herbicides				
Aldrin	17	17	B2	IRIS
Alpha BHC	2.7	2.7	B2	OEHHA
Alpha endosulfan (Endosulfan I)	--	--	--	--
Alpha chlordane	1.3	1.2	B2	OEHHA (c)
Gamma chlordane	1.3	1.2	B2	OEHHA (c)
Dieldrin	16	16	B2	IRIS
Endosulfan sulfate	--	--	--	--
Endrin	--	--	D	IRIS
Endrin aldehyde	--	--	D	IRIS
Endrin ketone	--	--	--	--
Gamma BHC (Lindane)	1.1	1.1	--	OEHHA
Heptachlor	4.1	4.1	B2	OEHHA
Heptachlor epoxide	5.5	5.5	B2	OEHHA
4,4'-DDD	0.24	0.24	B2	OEHHA

TABLE 7-2
CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER (a)
Oakland Army Base, Oakland, California

Chemical of Concern	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Reference
PCBs, Pesticides, and Herbicides				
4,4'-DDE	0.34	0.34	B2	OEHHA
4,4'-DDT	0.34	0.34	B2	OEHHA
Pentachlorophenol	0.081	0.018	B2	OEHAA
Toxaphene	1.2	1.2	B2	OEHHA
PCB-1248 (Aroclor 1248)	5	2	B2	OEHHA (d)
PCB-1260 (Aroclor 1260)	5	2	B2	OEHHA (d)
Dioxin-like Compounds				
2,3,7,8-tetrachlorodibenzo-p-dioxin	130,000	130,000	--	OEHHA

TABLE 7-2
CARCINOGENIC HUMAN HEALTH TOXICITY VALUES FOR CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER (a)
Oakland Army Base, Oakland, California

Notes:

(a) Abbreviations used in this table are as follows:

4,4'-DDD	1,1-dichloro-2,2-di(4-chlorophenyl)ethane
4,4'-DDE	1,1-dichloro-2,2-bis(4-chlorophenyl)ethane
4,4'-DDT	1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane
HEAST	Health Effects Assessment Summary Table
IRIS	Integrated Risk Information System
NCEA	National Center for Environmental Assessment
OEHHA	Office of Environmental Health Hazard Assessment
PCB	polychlorinated biphenyl

(b) U.S. EPA weight-of-evidence classifications are as follows:

A	Human Carcinogen
B1 or B2	Probable Human Carcinogen; B1 indicates that limited human data are available; B2 indicates that there is sufficient evidence in animals and inadequate or no evidence in humans.
C	Possible Human Carcinogen
D	Not Classifiable as to Human Carcinogenicity
E	Evidence of Non-Carcinogenicity in Humans

(c) No slope factor for alpha or gamma chlordane was available. The slope factor for chlordane was used.

(d) No slope factor for PCB Aroclor 1248 or 1260 was available. The slope factor for PCBs was used.

TABLE 7-3
EXPOSURE PARAMETERS USED TO CALCULATE
HUMAN HEALTH RISK-BASED REMEDIATION GOALS
Oakland Army Base, Oakland, California

Parameter	Symbol	Unit	Value	Note/Reference
Averaging Time	AT			
Carcinogens		year	70	Default value (a)
Non-carcinogens		year	ED	Default value (a)
Body Weight	BW			
Earthwork construction worker		kg	70	Default value (a)
Indoor commercial worker		kg	70	Default value (a)
Outdoor industrial worker		kg	70	Default value (a)
Maintenance personnel		kg	70	Default value (a)
Dermal Absorption Factor	ABS			
Arsenic			0.03	Default value (b)
Cadmium			0.001	Default value (b)
Other metals			0.01	Default value (c)
Chlordane			0.05	Specified by DTSC HERD
DDT			0.05	Specified by DTSC HERD
Other chlorinated pesticides			0.05	Specified by DTSC HERD
Benzo(a)pyrene			0.15	Specified by DTSC HERD
Other polycyclic aromatic hydrocarbons			0.15	Specified by DTSC HERD
Semi-volatile organic compounds			0.1	Default value (b)
Polychlorinated biphenyls			0.15	Specified by DTSC HERD
Volatile organic compounds			0.1	Default value (c)
Exposure Duration	ED			
Earthwork construction worker		year	1	Best professional judgement
Indoor commercial worker		year	25	Default value (a)
Outdoor industrial worker		year	25	Default value (a)
Maintenance personnel		year	25	Default value (a)

TABLE 7-3
EXPOSURE PARAMETERS USED TO CALCULATE
HUMAN HEALTH RISK-BASED REMEDIATION GOALS
Oakland Army Base, Oakland, California

Parameter	Symbol	Unit	Value	Note/Reference
Exposure Frequency	EF			
Earthwork construction worker		day/year	250	Default value (a)
Indoor commercial worker		day/year	250	Default value (a)
Outdoor industrial worker		day/year	250	Default value (a)
Maintenance personnel				
Performing excavation work		day/year	12	Default value (a); (d)
Performing non-excavation work		day/year	238	Default value (a); (d)
Exposure Interval	T			
Earthwork construction worker		s	3.16×10^7	Calculated as 3.16×10^7*ED
Indoor commercial worker		--	--	(e)
Outdoor industrial worker		--	--	(e)
Maintenance personnel		s	7.9×10^8	Calculated as 3.16×10^7*ED
Ingestion Rate for Soil	IR_{soil}			
Earthwork construction worker		mg/day	100	Equivalent to adult agricultural worker (c)
Indoor commercial worker		--	--	(e)
Outdoor industrial worker		--	--	(e)
Maintenance personnel		mg/day	100	Equivalent to adult agricultural worker (c)
Inhalation Rate for Air	IR_{air}			
Earthwork construction worker		m^3/day	20	Default value (a)
Indoor commercial worker		m^3/day	10	Specified by DTSC HERD
Outdoor industrial worker		m^3/day	20	Default value (a)
Maintenance personnel		m^3/day	20	Default value (a)
Particulate Emission Factor	PEF			
Earthwork construction worker		m^3/kg	4.63×10^9	Default value (a)
Indoor commercial worker		--	--	(e)
Outdoor industrial worker		--	--	(e)
Maintenance personnel		m^3/kg	4.63×10^9	Default value (a)

TABLE 7-3
EXPOSURE PARAMETERS USED TO CALCULATE
HUMAN HEALTH RISK-BASED REMEDIATION GOALS
Oakland Army Base, Oakland, California

Parameter	Symbol	Unit	Value	Note/Reference
Skin Surface Area Exposed to Soil	SA			
Earthwork construction worker		cm^2/day	5,700	(f)
Indoor commercial worker		--	--	(e)
Outdoor industrial worker		--	--	(e)
Maintenance personnel		cm^2/day	5,700	(f)
Soil-to-Air Volatilization Factor	VF			
Earthwork construction worker		m^3/kg		Chemical-specific value (g)
Indoor commercial worker		--	--	(h)
Outdoor industrial worker		--	--	(e)
Maintenance personnel		m^3/kg		Chemical-specific value (g)
Soil-to-Skin Adherence Factor	AF			
Earthwork construction worker		mg/cm^2	0.8	(f)
Indoor commercial worker		--	--	(e)
Outdoor industrial worker		--	--	(e)
Maintenance personnel		mg/cm^2	0.2	Default value for industrial worker (b)

Notes:

(a) U.S. EPA. 1991. *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim.* Office of Solid Waste and Emergency Response. Publication: 9285.7-01B.

(b) U.S. EPA. September 2001. *Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual – Part E (Supplemental Guidance for Dermal Risk Assessment), Interim*. Office of Solid Waste and Emergency Response.

(c) Cal-EPA. July 1992 (corrected and reprinted August 1996). *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities.*

(d) Exposure frequency for maintenance personnel is based upon best professional judgement and assumes individual will be engaged in earthwork activities for 12 days per year at the OARB and will conduct activities that do not involve excavation for 238 days per year at the base.

(e) Pathway not considered complete for potentially exposed population.

(f) DTSC. 7 January 2000. Memorandum to Human and Ecological Risk Division. *Guidance for the Dermal Exposure Pathway*.

(g) Soil-to-air volatilization factor is chemical-specific. Volatilization factors were calculated using the equation in Section 3.3.1 in U.S. EPA's Risk Assessment Guidance for Superfund, Part B, dated December 1991, and input parameters listed in Table 7-4 of this RAP.

(h) The soil-to-air volatilization factor was not utilized for the indoor worker. This exposure pathway was modeled using the Johnson and Ettinger model.

TABLE 7-4
PHYSICAL PARAMETERS USED TO CALCULATE
HUMAN HEALTH RISK-BASED REMEDIATION GOALS
Oakland Army Base, Oakland, California

Parameter	Symbol	Unit	Value	Note/Reference
Building Parameters				
Length of building	-	cm	6,000	Equivalent to one side of a 40,000 ft^2 building (a)
Width of building	-	cm	6,000	Equivalent to one side of a 40,000 ft^2 building (a)
Height of building	-	cm	488	Default value for Johnson and Ettinger model (b)
Slab thickness	-	cm	15	Default value for Johnson and Ettinger model (b)
Indoor air exchange rate	-	1/hr	1	Specified by DTSC HERD
Indoor pressure differential	-	$g/cm\text{-}s^2$	40	Default value for Johnson and Ettinger model (b)
Floor-wall seam crack width	-	cm	0.1	Default value for Johnson and Ettinger model (b)
Volumetric air content in cracks	-	-	0.163	Equivalent to volumetric air content in soil
Volumetric water content in cracks	-	-	0.196	Equivalent to volumetric water content in soil
Capillary Zone Parameters				
Total soil porosity in capillary zone	n_c	-	0.358	Equivalent to total soil porosity in vadose zone
Volumetric air content in capillary zone	θ_{ac}	-	0.035	One percent of total porosity
Volumetric water content in capillary zone	θ_{wc}	-	0.322	Calculated as n_c-θ_{ac}
Thickness of capillary zone	-	cm	17	Default value for Johnson and Ettinger model (b)
Climatic Parameters				
Mixing zone height	DH	cm	200	Default value (c)
Wind speed above ground surface	V	cm/s	225	Default value (c)
Soil Parameters				
Fraction organic carbon content in soil	f_{oc}	-	0.026	Average of site-specific vadose zone data (d)
Soil dry bulk density	ρ_b	g/cm^3	1.70	Average of site-specific vadose zone data (d)
Soil particle density	ρ_d	g/cm^3	2.65	Average of site-specific vadose zone data (d)
Water content by mass (g water/g soil)	w	-	0.115	Average of site-specific vadose zone data (d)
Total soil porosity in vadose zone	n	-	0.358	Calculated as $1-\rho_b/\rho_d$
Volumetric water content in vadose zone	θ_w	-	0.196	Calculated as $w\rho_b/\rho_w$
Volumetric air content in vadose zone	θ_a	-	0.163	Calculated as $n-\theta_w$
Assumed soil type	-	-	Sand	Review of OARB lithologic logs
Air-filled soil permeability	k_v	cm^2	1×10^{-8}	Typical value for sand (e); (b)
Soil temperature	-	C	15	Default value for San Francisco Bay Area (b)

TABLE 7-4
PHYSICAL PARAMETERS USED TO CALCULATE
HUMAN HEALTH RISK-BASED REMEDIATION GOALS
Oakland Army Base, Oakland, California

Parameter	Symbol	Unit	Value	Note/Reference
Soil Source Parameters				
Depth below ground surface to top of source soil	h_2	cm	15	Thickness of slab overlying soil surface (b)
Depth below ground surface to bottom of source soil	h_1	cm	150	Site-specific value (5 feet)
Thickness of soil source	-	cm	135	Calculated as h_2-h_1
Area of soil source	A	m^2	2,025	Default value (c)
Length of side of soil source	LS	m	45	Default value (c)

Notes:

(a) Building size is based on best professional judgement and assumes a typical commercial structure in the Bay Area is 40,000 ft^2.

(b) U.S. EPA. December 2000. User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion *Into Buildings (Revised).* Model dated April 2001.

(c) U.S. EPA. 1991. *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim.* Office of Solid Waste and Emergency Response. Publication: 9285.7-01B.

(d) Sierra Testing Laboratories, Inc. 10 November 1998. *Laboratory Test Results*. Letter from Michael P. Walker, Project Manager, to Anne Cavazos, ICF Kaiser Engineers, Inc.

(e) Nazaroff, W.W. May 1992. *Radon Transport from Soil to Air.* Review of Geophysics. Vol. 30, pp. 137-160.

TABLE 7-5
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT EARTHWORK CONSTRUCTION WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Earthwork Construction Worker (mg/kg); (d)
Metals				
Antimony	(e)	280	(f)	280
Arsenic	(e)	130	20	20
Barium	(e)	43,000	(f)	43,000
Beryllium	(e)	1,300	20,000	1,300
Cadmium	(e)	490	180	180
Chromium (III)	(e)	280,000	(f)	MAX(100,000); (m)
Chromium (VI)	(e)	1,500	86	86
Chromium, Total	(e)	10,000 (l)	600 (l)	600
Cobalt	(e)	42,000	(f)	42,000
Copper	(e)	26,000	(f)	26,000
Lead	--	--	--	3,500 (h)
Manganese	(e)	25,000	(f)	25,000
Mercury	(e)	60	(f)	60
Molybdenum	(e)	3,500	(f)	3,500
Nickel	(e)	14,000	180,000	14,000
Selenium	(e)	3,500	(f)	3,500
Silver	(e)	3,500	(f)	3,500
Thallium	(e)	49	(f)	49
Vanadium	(e)	4,900	(f)	4,900
Zinc	(e)	210,000	(f)	MAX(100,000)
Volatile Organic Compounds				
1,1,2,2-tetrachloroethane	7,000	3,400	18	18
1,1,2-trichloroethane	9,400	140	42	42
1,1-dichloroethane	5,900	1,700	160	160
1,1-dichloroethene	710	63	(f)	63
1,2,3-trichloropropane	3,600	410	0.7	0.7
1,2,4-trimethylbenzene	5,400	170	(f)	170
1,2-dichloroethane	8,100	27	18	18
1,2-dichloropropane	3,600	24	43	24
1,3,5-trimethylbenzene	1,300	87	(f)	87
Acetone	130,000	2,700	(f)	2,700
Benzene	3,000	21	8.5	8.5
Bromodichloromethane	7,900	440	12	12
Carbon disulfide	1,600	1,200	(f)	1,200
Carbon tetrachloride	1,100	4.6	3.0	3.0
Chloroform	14,000	190	64	64

TABLE 7-5
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT EARTHWORK CONSTRUCTION WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Earthwork Construction Worker (mg/kg); (d)
Volatile Organic Compounds				
Dibromochloromethane	4,100	860	32	32
cis-1,2-dichloroethene	3,700	140	(f)	140
trans-1,2-dichloroethene	7,100	190	(f)	190
Ethylbenzene	1,200	6,200	(f)	SAT(1,200); (i)
Isopropylbenzene (Cumene)	3,800	7,200	(f)	SAT(3,800)
Methyl ethyl ketone	49,000	12,000	(f)	12,000
Methyl isobutyl ketone	5,500	1,500	(f)	1,500
Methyl tertiary butyl ether	21,000	19,000	850	850
Methylene chloride	5,800	5,200	180	180
n-butylbenzene	3,300	550	(f)	550
n-propylbenzene	1,200	350	(f)	350
p-cymene (p-isopropyltoluene)	3,700	7,200	(f)	SAT(3,700)
sec-butylbenzene	4,000	320	(f)	320
tert-butylbenzene	530	290	(f)	290
Tetrachloroethene	2,200	230	65	65
Toluene	3,900	2,700	(f)	2,700
Trichloroethene	3,000	93	100	93
Trichlorofluoromethane	4,300	4,900	(f)	SAT(4,300)
Vinyl chloride	670	61	0.6	0.6
Xylenes, Total	1,200	42,000	(f)	SAT(1,200)
Semi-volatile Organic Compounds				
Acenaphthene	(e)	8,000	(f)	8,000
Acenaphthylene	(e)	(g)	(f)	(j)
Anthracene	(e)	39,000	(f)	39,000
Benzidine	(e)	390	0.02	0.02
Benzo(a)anthracene	(e)	(g)	7.6	7.6
Benzo(a)pyrene	(e)	(g)	0.8	0.8
Benzo(b)fluoranthene	(e)	(g)	7.6	7.6
Benzo(b,k)fluoranthene	(e)	(g)	7.6	7.6
Benzo(g,h,i)perylene	(e)	(g)	(f)	(j)
Benzo(k)fluoranthene	(e)	(g)	7.6	7.6
Bis(2-ethylhexyl)phthalate	100	3,600	4,150	SAT(100)
Chrysene	(e)	(g)	86	86
Dibenz(a,h)anthracene	(e)	(g)	2.2	2.2
Fluoranthene	(e)	5,100	(f)	5,100
Fluorene	(e)	5,100	(f)	5,100

TABLE 7-5
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT EARTHWORK CONSTRUCTION WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Earthwork Construction Worker (mg/kg); (d)
Semi-volatile Organic Compounds				
Hexachlorobutadiene	83,000	49	148	49
Indeno(1,2,3-c,d)pyrene	(e)	(g)	7.6	7.6
Naphthalene	(e)	150	(f)	150
Phenanthrene	(e)	38,000	(f)	38,000
Pyrene	(e)	3,900	(f)	3,900
Total Petroleum Hydrocarbons				
TPH Diesel	--	--	--	(k)
TPH Gasoline	--	--	--	(k)
TPH Motor Oil	--	--	--	(k)
TPH Recoverable	--	--	--	(k)
PCBs, Pesticides, and Herbicides				
Aldrin	(e)	8.4	1.2	1.2
Alpha BHC	(e)	82	7.1	7.1
Alpha endosulfan (Endosulfan I)	(e)	1,300	(f)	1,300
Alpha chlordane	110	140	16	16
Gamma chlordane	110	140	16	16
Dieldrin	(e)	15	1.3	1.3
Endosulfan sulfate	(e)	1,500	(f)	1,500
Endrin	(e)	90	(f)	90
Endrin aldehyde	(e)	91	(f)	91
Endrin ketone	(e)	91	(f)	91
Gamma BHC (Lindane)	(e)	81	17	17
Heptachlor	(e)	120	4.1	4.1
Heptachlor epoxide	60	3.9	3.8	3.8
4,4'-DDD	(e)	150	89	89
4,4'-DDE	(e)	130	54	54
4,4'-DDT	(e)	150	63	63
Pentachlorophenol	(e)	8,200	260	260
Toxaphene	(e)	(g)	1.4	1.4
PCB-1248 (Aroclor 1248)	570	(g)	1.8	1.8
PCB-1260 (Aroclor 1260)	(e)	(g)	1.8	1.8
Dioxin-like Compounds				
2,3,7,8-tetrachlorodibenzo-p-dioxin	(e)	(g)	0.0001	0.0001

TABLE 7-5
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL IN SOILTO PROTECT EARTHWORK CONSTRUCTION WORKERS
Oakland Army Base, Oakland, California

Notes:

(a) Soil saturation concentration for COCs are calculated below using equation from U.S. EPA, 1 November 2000, *Region 9 Preliminary Remediation Goals (PRGs) 1999*, Memorandum from Stanford J. Smucker, Ph.D., Regional Toxicologist (SFD-8-B), Technical Support Team. Values of site-specific physical parameters used to calculate soil saturation concentrations are summarized in Table 7-2.

(b) Risk-based remediation goals in this table have been calculated through use of equations presented in Section 7 of the RAP. Human health toxicity values and physical and exposure parameters used in calculating remediation goals are summarized in Tables 7-1 through 7-4.

(c) Risk-based remediation goals assume a non-carcinogenic target risk level that corresponds to a hazard index of 1 and a carcinogenic target risk level of one-in-one million (i.e., 10^{-6}) incremental risk of an individual developing cancer over a lifetime from exposure to a single chemical.

(d) Unless otherwise noted, value cited is the lesser of the non-carcinogenic and carcinogenic risk-based remediation goals when both values could be calculated.

(e) No soil saturation concentrations were calculated for compounds that are solids under ambient temperature and pressure.

(f) U.S. EPA or OEHHA do not classify compound as a potential carcinogen, thus no published carcinogenic slope factor is available for this compound.

(g) No published chronic reference dose is available for this compound, and no suitable surrogate compound was identified.

(h) Risk-based remediation goal for lead calculated using DTSC Lead Spread Version 7.0 computer model (See Appendix B)

(i) Prefix "SAT" denotes risk -based value exceeds calculated soil saturation concentration, thus, the estimated saturation saturation value is listed inside the parenthesis.

(j) No published human health toxicity values available for compound. Consequently, risk-based remediation goal could not be calculated for this compound.

(k) No site-specific risk-based remediation goals were calculated for petroleum hydrocarbons. Fuel Storage Tank Sites Cleanup Levels derived by the Army are adopted as remediation goals for petroleum hydrocarbons. Refer to Table 7-11.

(l) The remediation goal for total chromium was calculated from the chromium (III) and chromium (IV) remediation goal assuming a 1:6 ratio of chromium(VI) to chromium(III), consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

(m Prefix "MAX" denotes that the calculated risk-based concentration is 100,000 mg/kg or greater. A non-risk based "ceiling limit" concentration for metals and certain SVOCs that are solids at ambient temperatures is given as 100,000 mg/kg, consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

TABLE 7-6
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Indoor Commercial Worker (mg/kg); (d)
Metals				
Antimony	(e)	--	(f)	(h)
Arsenic	(e)	--	--	(h)
Barium	(e)	--	(f)	(h)
Beryllium	(e)	--	--	(h)
Cadmium	(e)	--	--	(h)
Chromium (III)	(e)	--	(f)	(h)
Chromium (VI)	(e)	--	--	(h)
Chromium, Total	(e)	--	--	(h)
Cobalt	(e)	--	(f)	(h)
Copper	(e)	--	(f)	(h)
Lead	(e)	--	--	(h)
Manganese	(e)	--	(f)	(h)
Mercury	(e)	--	(f)	(h)
Molybdenum	(e)	--	(f)	(h)
Nickel	(e)	--	--	(h)
Selenium	(e)	--	(f)	(h)
Silver	(e)	--	(f)	(h)
Thallium	(e)	--	(f)	(h)
Vanadium	(e)	--	(f)	(h)
Zinc	(e)	--	(f)	(h)
Volatile Organic Compounds				
1,1,2,2-tetrachloroethane	7,000	16,000	3.8	3.8
1,1,2-trichloroethane	9,300	220	2.7	2.7
1,1-dichloroethane	5,900	780	2.7	2.7
1,1-dichloroethene	710	43	(f)	43
1,2,3-trichloropropane	3,600	2,300	0.2	0.2
1,2,4-trimethylbenzene	5,400	470	(f)	470
1,2-dichloroethane	8,000	27	0.8	0.8
1,2-dichloropropane	3,600	18	0.1	0.1
1,3,5-trimethylbenzene	1,300	130	(f)	130
Acetone	130,000	10,000	(f)	10,000
Benzene	3,000	17	0.3	0.3
Bromodichloromethane	7,900	650	0.7	0.7
Carbon disulfide	1,600	950	(f)	950
Carbon tetrachloride	1,100	3.6	0.1	0.1
Chloroform	14,000	100	1.5	1.5

TABLE 7-6
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Indoor Commercial Worker (mg/kg); (d)
Volatile Organic Compounds				
Dibromochloromethane	4,000	1,300	2	2
cis-1,2-dichloroethene	3,700	83	(f)	83
trans-1,2-dichloroethene	7,100	95	(f)	95
Ethylbenzene	1,200	9,100	(f)	SAT(1,200); (i)
Isopropylbenzene (Cumene)	3,800	36,000	(f)	SAT(3,800)
Methyl ethyl ketone	49,000	32,000	(f)	32,000
Methyl isobutyl ketone	5,500	1,200	(f)	1,200
Methyl tertiary butyl ether	21,000	18,000	33	33
Methylene chloride	5,800	5,200	4.8	4.8
n-butylbenzene	3,300	1,600	(f)	1,600
n-propylbenzene	1,200	530	(f)	530
p-cymene (p-isopropyltoluene)	3,700	32,000	(f)	SAT(3,700)
sec-butylbenzene	4,000	200	(f)	200
tert-butylbenzene	530	300	(f)	300
Tetrachloroethene	2,200	210	2.8	2.8
Toluene	3,900	4,200	(f)	3,900
Trichloroethene	3,000	54	2.5	2.5
Trichlorofluoromethane	4,300	3,600	(f)	3,600
Vinyl chloride	670	140	0.05	0.05
Xylenes, Total	1,200	110,000	(f)	SAT(1,200)
Semi-volatile Organic Compounds				
Acenaphthene	(e)	3,600,000	(f)	MAX(100,000); (l)
Acenaphthylene	(e)	(g)	(f)	(j)
Anthracene	(e)	200,000,000	(f)	MAX(100,000)
Benzidine	(e)	--	--	(h)
Benzo(a)anthracene	(e)	(g)	--	(h)
Benzo(a)pyrene	(e)	(g)	--	(h)
Benzo(b)fluoranthene	(e)	(g)	--	(h)
Benzo(b,k)fluoranthene	(e)	(g)	--	(h)
Benzo(g,h,i)perylene	(e)	(g)	(f)	(j)
Benzo(k)fluoranthene	(e)	(g)	--	(h)
Bis(2-ethylhexyl)phthalate	100	--	--	(h)
Chrysene	(e)	(g)	--	(h)
Dibenz(a,h)anthracene	(e)	(g)	--	(h)
Fluoranthene	(e)	--	(f)	(h)
Fluorene	(e)	250,000,000	(f)	MAX(100,000)

TABLE 7-6
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Indoor Commercial Worker (mg/kg); (d)
Semi-volatile Organic Compounds				
Hexachlorobutadiene	83,000	--	--	(h)
Indeno(1,2,3-c,d)pyrene	(e)	(g)	--	(h)
Naphthalene	(e)	3,900	(f)	3,900
Phenanthrene	(e)	1,400,000,000	(f)	MAX(100,000)
Pyrene	(e)	490,000,000	(f)	MAX(100,000)
Total Petroleum Hydrocarbons				
TPH Diesel	--	--	--	(k)
TPH Gasoline	--	--	--	(k)
TPH Motor Oil	--	--	--	(k)
TPH Recoverable	--	--	--	(k)
PCBs, Pesticides, and Herbicides				
Aldrin	(e)	--	--	(h)
Alpha BHC	(e)	--	--	(h)
Alpha endosulfan (Endosulfan I)	(e)	--	(f)	(h)
Alpha chlordane	110	--	--	(h)
Gamma chlordane	110	--	--	(h)
Dieldrin	(e)	--	--	(h)
Endosulfan sulfate	(e)	--	(f)	(h)
Endrin	(e)	--	(f)	(h)
Endrin aldehyde	(e)	--	(f)	(h)
Endrin ketone	(e)	--	(f)	(h)
Gamma BHC (Lindane)	(e)	--	--	(h)
Heptachlor	(e)	--	--	(h)
Heptachlor epoxide	60	--	--	(h)
4,4'-DDD	(e)	--	--	(h)
4,4'-DDE	(e)	--	--	(h)
4,4'-DDT	(e)	--	--	(h)
Pentachlorophenol	(e)	--	--	(h)
Toxaphene	(e)	--	--	(h)
PCB-1248 (Aroclor 1248)	570	(g)	--	(h)
PCB-1260 (Aroclor 1260)	(e)	(g)	--	(h)
Dioxin-like Compounds				
2,3,7,8-tetrachlorodibenzo-p-dioxin	(e)	(g)	--	(h)

TABLE 7-6
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Notes:

(a) Soil saturation concentration for COCs are calculated below using equation from U.S. EPA, 1 November 2000, *Region 9 Preliminary Remediation Goals (PRGs) 1999*, Memorandum from Stanford J. Smucker, Ph.D., Regional Toxicologist (SFD-8-B), Technical Support Team. Values of site-specific physical parameters used to calculate soil saturation concentrations are summarized in Table 7-2.

(b) Risk-based remediation goals in this table have been calculated through use of U.S. EPA Johnson and Ettinger vapor intrusion computer model (See Appendix). Human health toxicity values and physical and exposure parameters used in calculating remediation goals are summarized in Tables 7-1 through 7-4.

(c) Risk-based remediation goals assume a non-carcinogenic target risk level that corresponds to a hazard index of 1 and a carcinogenic target risk level of one-in-one million (i.e., 10^{-6}) incremental risk of an individual developing cancer over a lifetime from exposure to a single chemical.

(d) Unless otherwise noted, value cited is the lesser of the non-carcinogenic and carcinogenic risk-based remediation goals when both values could be calculated.

(e) No soil saturation concentrations were calculated for compounds that are solids under ambient temperature and pressure.

(f) U.S. EPA or OEHHA do not classify compound as a potential carcinogen, thus no published carcinogenic slope factor is available for this compound.

(g) No published chronic reference dose is available for this compound, and no suitable surrogate compound was identified.

(h) Vapor intrusion is the only potentially complete exposure pathway for this population. Consequently, risk-based remediation goals for this population are calculated only for those compounds considered to be volatile. Volatile compounds are defined to be chemicals that have Henry Law constants greater than 10^{-5} atm-m^3/mol and molecular weights less than 200 g/mol.

(i) Prefix "SAT" denotes risk -based value exceeds calculated soil saturation concentration, thus, the estimated saturation value is listed inside the parenthesis.

(j) No published human health toxicity values available for compound. Consequently, risk-based remediation goal could not be calculated for compound.

(k) No site-specific risk-based remediation goals were calculated for petroleum hydrocarbons. Fuel Storage Tank Sites Cleanup Levels derived by the Army are adopted as remediation goals for petroleum hydrocarbons. Refer to Table 7-11.

(l) Prefix "MAX" denotes that the calculated risk-based concentration is 100,000 mg/kg or greater. A non-risk based "ceiling limit" concentration for metals and certain SVOCs that are solids at ambient temperatures is given as 100,000 mg/kg, consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

TABLE 7-7
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT OUTDOOR INDUSTRIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Outdoor Industrial Worker (mg/kg); (d)
Metals				
Antimony	(e)	--	(f)	(h)
Arsenic	(e)	--	--	(h)
Barium	(e)	--	(f)	(h)
Beryllium	(e)	--	--	(h)
Cadmium	(e)	--	--	(h)
Chromium (III)	(e)	--	(f)	(h)
Chromium (VI)	(e)	--	--	(h)
Chromium, Total	(e)	--	--	(h)
Cobalt	(e)	--	(f)	(h)
Copper	(e)	--	(f)	(h)
Lead	(e)	--	--	(h)
Manganese	(e)	--	(f)	(h)
Mercury	(e)	--	(f)	(h)
Molybdenum	(e)	--	(f)	(h)
Nickel	(e)	--	--	(h)
Selenium	(e)	--	(f)	(h)
Silver	(e)	--	(f)	(h)
Thallium	(e)	--	(f)	(h)
Vanadium	(e)	--	(f)	(h)
Zinc	(e)	--	(f)	(h)
Volatile Organic Compounds				
1,1,2,2-tetrachloroethane	7,000	25,000	5.8	5.8
1,1,2-trichloroethane	9,400	2,200	11	11
1,1-dichloroethane	5,900	9,600	34	34
1,1-dichloroethene	710	330	(f)	330
1,2,3-trichloropropane	3,600	3,300	0.2	0.2
1,2,4-trimethylbenzene	5,400	850	(f)	850
1,2-dichloroethane	8,100	140	3.9	3.9
1,2-dichloropropane	3,600	140	9.7	9.7
1,3,5-trimethylbenzene	1,300	440	(f)	440
Acetone	130,000	16,000	(f)	16,000
Benzene	3,000	110	1.8	1.8
Bromodichloromethane	7,900	2,500	2.7	2.7
Carbon disulfide	1,600	6,400	(f)	SAT(1,600)
Carbon tetrachloride	1,100	24	0.6	0.6
Chloroform	14,000	1,000	15	15

TABLE 7-7
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT OUTDOOR INDUSTRIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Outdoor Industrial Worker (mg/kg); (d)
Volatile Organic Compounds				
Dibromochloromethane	4,100	5,600	8.4	8.4
cis-1,2-dichloroethene	3,700	750	(f)	750
trans-1,2-dichloroethene	7,100	990	(f)	990
Ethylbenzene	1,200	47,000	(f)	SAT(1,200); (i)
Isopropylbenzene (Cumene)	3,800	60,000	(f)	SAT(3,800)
Methyl ethyl ketone	49,000	65,000	(f)	SAT(49,000)
Methyl isobutyl ketone	5,500	8,600	(f)	SAT(5,500)
Methyl tertiary butyl ether	21,000	110,000	190	190
Methylene chloride	5,800	49,000	50	50
n-butylbenzene	3,300	3,900	(f)	SAT(3,300)
n-propylbenzene	1,200	2,200	(f)	SAT(1,200)
p-cymene (p-isopropyltoluene)	3,700	59,000	(f)	SAT(3,700)
sec-butylbenzene	4,000	2,000	(f)	2,000
tert-butylbenzene	530	1,700	(f)	SAT(530)
Tetrachloroethene	2,200	1,300	20	20
Toluene	3,900	15,000	(f)	SAT(3,900)
Trichloroethene	3,000	510	20	20
Trichlorofluoromethane	4,300	27,000	(f)	SAT(4,300)
Vinyl chloride	670	340	0.1	0.1
Xylenes, Total	1,200	240,000	(f)	SAT(1,200)
Semi-volatile Organic Compounds				
Acenaphthene	(e)	960,000	(f)	MAX(100,000); (l)
Acenaphthylene	(e)	(g)	(f)	(j)
Anthracene	(e)	15,000,000	(f)	MAX(100,000)
Benzidine	(e)	--	--	(h)
Benzo(a)anthracene	(e)	(g)	--	(h)
Benzo(a)pyrene	(e)	(g)	--	(h)
Benzo(b)fluoranthene	(e)	(g)	--	(h)
Benzo(b,k)fluoranthene	(e)	(g)	--	(h)
Benzo(g,h,i)perylene	(e)	(g)	(f)	(j)
Benzo(k)fluoranthene	(e)	(g)	--	(h)
Bis(2-ethylhexyl)phthalate	100	--	--	(h)
Chrysene	(e)	(g)	--	(h)
Dibenz(a,h)anthracene	(e)	(g)	--	(h)
Fluoranthene	(e)	--	(f)	(h)
Fluorene	(e)	1,700,000	(f)	MAX(100,000)

TABLE 7-7
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT OUTDOOR INDUSTRIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Outdoor Industrial Worker (mg/kg); (d)
Semi-volatile Organic Compounds				
Hexachlorobutadiene	83,000	--	--	(h)
Indeno(1,2,3-c,d)pyrene	(e)	(g)	--	(h)
Naphthalene	(e)	820	(f)	820
Phenanthrene	(e)	12,000,000	(f)	MAX(100,000)
Pyrene	(e)	2,200,000	(f)	MAX(100,000)
Total Petroleum Hydrocarbons				
TPH Diesel	--	--	--	(k)
TPH Gasoline	--	--	--	(k)
TPH Motor Oil	--	--	--	(k)
TPH Recoverable	--	--	--	(k)
PCBs, Pesticides, and Herbicides				
Aldrin	(e)	--	--	(h)
Alpha BHC	(e)	--	--	(h)
Alpha endosulfan (Endosulfan I)	(e)	--	(f)	(h)
Alpha chlordane	110	--	--	(h)
Gamma chlordane	110	--	--	(h)
Dieldrin	(e)	--	--	(h)
Endosulfan sulfate	(e)	--	(f)	(h)
Endrin	(e)	--	(f)	(h)
Endrin aldehyde	(e)	--	(f)	(h)
Endrin ketone	(e)	--	(f)	(h)
Gamma BHC (Lindane)	(e)	--	--	(h)
Heptachlor	(e)	--	--	(h)
Heptachlor epoxide	60	--	--	(h)
4,4'-DDD	(e)	--	--	(h)
4,4'-DDE	(e)	--	--	(h)
4,4'-DDT	(e)	--	--	(h)
Pentachlorophenol	(e)	--	--	(h)
Toxaphene	(e)	--	--	(h)
PCB-1248 (Aroclor 1248)	570	(g)	--	(h)
PCB-1260 (Aroclor 1260)	(e)	(g)	--	(h)
Dioxin-like Compounds				
2,3,7,8-tetrachlorodibenzo-p-dioxin	(e)	(g)	--	(h)

TABLE 7-7
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT OUTDOOR INDUSTRIAL WORKERS
Oakland Army Base, Oakland, California

Notes:

(a) Soil saturation concentration for COCs are calculated below using equation from U.S. EPA, 1 November 2000, *Region 9 Preliminary Remediation Goals (PRGs) 1999*, Memorandum from Stanford J. Smucker, Ph.D., Regional Toxicologist (SFD-8-B), Technical Support Team. Values of site-specific physical parameters used to calculate soil saturation concentrations are summarized in Table 7-2.

(b) Risk-based remediation goals in this table have been calculated through use of equations presented in Section 7 of the RAP. Human health toxicity values and physical and exposure parameters used in calculating remediation goals are summarized in Tables 7-1 through 7-4.

(c) Risk-based remediation goals assume a non-carcinogenic target risk level that corresponds to a hazard index of 1 and a carcinogenic target risk level of one-in-one million (i.e., 10^{-6}) incremental risk of an individual developing cancer over a lifetime from exposure to a single chemical.

(d) Unless otherwise noted, value cited is the lesser of the non-carcinogenic and carcinogenic risk-based remediation goals when both values could be calculated.

(e) No soil saturation concentrations were calculated for compounds that are solids under ambient temperature and pressure.

(f) U.S. EPA or OEHHA do not classify compound as a potential carcinogen, thus no published carcinogenic slope factor is available for this compound.

(g) No published chronic reference dose is available for this compound, and no suitable surrogate compound was identified.

(h) Vapor intrusion is the only potentially complete exposure pathway for this population. Consequently, risk-based remediation goals for this population are calculated only for those compounds considered to be volatile. Volatile compounds are defined to be chemicals that have Henry Law constants greater than 10^{-5} atm-m^3/mol and molecular weights less than 200 g/mol.

(i) Prefix "SAT" denotes risk -based value exceeds calculated soil saturation concentration, thus, the estimated saturation value is listed inside the parenthesis.

(j) No published human health toxicity values available for compound. Consequently, risk-based remediation goal could not be calculated for compound.

(k) No site-specific risk-based remediation goals were calculated for petroleum hydrocarbons. Fuel Storage Tank Sites Cleanup Levels derived by the Army are adopted as remediation goals for petroleum hydrocarbons. Refer to Table 7-11.

(l) Prefix "MAX" denotes that the calculated risk-based concentration is 100,000 mg/kg or greater. A non-risk based "ceiling limit" concentration for metals and certain SVOCs that are solids at ambient temperatures is given as 100,000 mg/kg, consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

TABLE 7-8
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT MAINTENANCE PERSONNEL
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Maintenance Personnel (mg/kg); (d)
Metals				
Antimony	(e)	7,600	(f)	7,600
Arsenic	(e)	4,800	30	30
Barium	(e)	1,100,000	(f)	MAX(100,000); (m)
Beryllium	(e)	34,000	16,000	16,000
Cadmium	(e)	11,000	150	150
Chromium (III)	(e)	15,000,000	(f)	MAX(100,000)
Chromium (VI)	(e)	38,000	87	87
Chromium, Total	(e)	260,000 (l)	610 (l)	610
Cobalt	(e)	1,100,000	(f)	MAX(100,000)
Copper	(e)	710,000	(f)	MAX(100,000)
Lead	--	--	--	77,000 (h)
Manganese	(e)	560,000	(f)	MAX(100,000)
Mercury	(e)	1,600	(f)	1,600
Molybdenum	(e)	96,000	(f)	96,000
Nickel	(e)	380,000	150,000	MAX(100,000)
Selenium	(e)	96,000	(f)	96,000
Silver	(e)	96,000	(f)	96,000
Thallium	(e)	1,300	(f)	1,300
Vanadium	(e)	130,000	(f)	MAX(100,000)
Zinc	(e)	5,700,000	(f)	MAX(100,000)
Volatile Organic Compounds				
1,1,2,2-tetrachloroethane	7,000	280,000	56	56
1,1,2-trichloroethane	9,300	21,000	140	140
1,1-dichloroethane	5,900	170,000	610	610
1,1-dichloroethene	710	6,300	(f)	SAT(710); (i)
1,2,3-trichloropropane	3,600	32,000	2.1	2.1
1,2,4-trimethylbenzene	5,400	17,000	(f)	SAT(5,400)
1,2-dichloroethane	8,100	2,800	71	71
1,2-dichloropropane	3,600	2,300	160	160
1,3,5-trimethylbenzene	1,300	9,000	(f)	SAT(1,300)
Acetone	130,000	120,000	(f)	120,000
Benzene	3,000	2,100	34	34
Bromodichloromethane	7,900	41,000	40	40
Carbon disulfide	1,600	120,000	(f)	SAT(1,600)
Carbon tetrachloride	1,100	460	12	12
Chloroform	14,000	18,000	230	230

TABLE 7-8
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT MAINTENANCE PERSONNEL
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Maintenance Personnel (mg/kg); (d)
Volatile Organic Compounds				
Dibromochloromethane	4,100	74,000	110	110
cis-1,2-dichloroethene	3,700	14,000	(f)	SAT(3,700)
trans-1,2-dichloroethene	7,100	19,000	(f)	SAT(7,100)
Ethylbenzene	1,200	490,000	(f)	SAT(1,200)
Isopropylbenzene (Cumene)	3,800	550,000	(f)	SAT(3,800)
Methyl ethyl ketone	49,000	1,100,000	(f)	SAT(49,000)
Methyl isobutyl ketone	5,500	150,000	(f)	SAT(5,500)
Methyl tertiary butyl ether	21,000	1,800,000	3,200	3,200
Methylene chloride	5,800	380,000	650	650
n-butylbenzene	3,300	45,000	(f)	SAT(3,300)
n-propylbenzene	1,200	31,000	(f)	SAT(1,200)
p-cymene (p-isopropyltoluene)	3,700	550,000	(f)	SAT(3,700)
sec-butylbenzene	4,000	29000	(f)	SAT(4,000)
tert-butylbenzene	530	26,000	(f)	SAT(530)
Tetrachloroethene	2,200	22,000	220	220
Toluene	3,900	270,000	(f)	SAT(3,900)
Trichloroethene	3,000	9,000	390	390
Trichlorofluoromethane	4,300	480,000	(f)	SAT(4,300)
Vinyl chloride	670	5,800	2.5	2.5
Xylenes, Total	1,200	3,900,000	(f)	SAT(1,200)
Semi-volatile Organic Compounds				
Acenaphthene	(e)	460,000	(f)	MAX(100,000)
Acenaphthylene	(e)	(g)	(f)	(j)
Anthracene	(e)	2,300,000	(f)	MAX(100,000)
Benzidine	(e)	23,000	0.04	0.04
Benzo(a)anthracene	(e)	(g)	18	18
Benzo(a)pyrene	(e)	(g)	1.8	1.8
Benzo(b)fluoranthene	(e)	(g)	18	18
Benzo(b,k)fluoranthene	(e)	(g)	18	18
Benzo(g,h,i)perylene	(e)	(g)	(f)	(j)
Benzo(k)fluoranthene	(e)	(g)	18	18
Bis(2-ethylhexyl)phthalate	100	200,000	9,100	SAT(100)
Chrysene	(e)	(g)	200	200
Dibenz(a,h)anthracene	(e)	(g)	5	5
Fluoranthene	(e)	310,000	(f)	MAX(100,000)
Fluorene	(e)	310,000	(f)	MAX(100,000)

TABLE 7-8
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT MAINTENANCE PERSONNEL
Oakland Army Base, Oakland, California

Chemical of Concern	Estimated Soil Saturation Concentration (mg/kg); (a)	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (mg/kg); (b); (c)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (mg/kg); (b); (c)	Lowest Remediation Goal to Protect Maintenance Personnel (mg/kg); (d)
Semi-volatile Organic Compounds				
Hexachlorobutadiene	83,000	2,800	340	340
Indeno(1,2,3-c,d)pyrene	(e)	(g)	18	18
Naphthalene	(e)	15,000	(f)	15,000
Phenanthrene	(e)	2,300,000	(f)	MAX(100,000)
Pyrene	(e)	230,000	(f)	MAX(100,000)
Total Petroleum Hydrocarbons				
TPH Diesel	--	--	--	(k)
TPH Gasoline	--	--	--	(k)
TPH Motor Oil	--	--	--	(k)
TPH Recoverable	--	--	--	(k)
PCBs, Pesticides, and Herbicides				
Aldrin	(e)	400	2.1	2.1
Alpha BHC	(e)	3,800	13	13
Alpha endosulfan (Endosulfan I)	(e)	69,000	(f)	69,000
Alpha chlordane	110	6,500	29	29
Gamma chlordane	110	6,500	29	29
Dieldrin	(e)	700	2.3	2.3
Endosulfan sulfate	(e)	73,000	(f)	73,000
Endrin	(e)	4,000	(f)	4,000
Endrin aldehyde	(e)	4,000	(f)	4,000
Endrin ketone	(e)	4,000	(f)	4,000
Gamma BHC (Lindane)	(e)	3,800	32	32
Heptachlor	(e)	6,000	8.2	8.2
Heptachlor epoxide	60	170	6.8	6.8
4,4'-DDD	(e)	6,700	160	160
4,4'-DDE	(e)	6,300	100	100
4,4'-DDT	(e)	6,700	110	110
Pentachlorophenol	(e)	380,000	460	460
Toxaphene	(e)	(g)	5.3	5.3
PCB-1248 (Aroclor 1248)	570	(g)	4.4	4.4
PCB-1260 (Aroclor 1260)	(e)	(g)	4.4	4.4
Dioxin-like Compounds				
2,3,7,8-tetrachlorodibenzo-p-dioxin	(e)	(g)	0.0002	0.0002

TABLE 7-8
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT MAINTENANCE PERSONNEL
Oakland Army Base, Oakland, California

Notes:

(a) Soil saturation concentration for COCs are calculated below using equation from U.S. EPA, 1 November 2000, *Region 9 Preliminary Remediation Goals (PRGs) 1999*, Memorandum from Stanford J. Smucker, Ph.D., Regional Toxicologist (SFD-8-B), Technical Support Team. Values of site-specific physical parameters used to calculate soil saturation concentrations are summarized in Table 7-2.

(b) Risk-based remediation goals in this table have been calculated through use of equations presented in Section 7 of the RAP. Human health toxicity values and physical and exposure parameters used in calculating remediation goals are summarized in Tables 7-1 through 7-4.

(c) Risk-based remediation goals assume a non-carcinogenic target risk level that corresponds to a hazard index of 1 and a carcinogenic target risk level of one-in-one million (i.e., 10^{-6}) incremental risk of an individual developing cancer over a lifetime from exposure to a single chemical.

(d) Unless otherwise noted, value cited is the lesser of the non-carcinogenic and carcinogenic risk-based remediation goals when both values could be calculated.

(e) No soil saturation concentrations were calculated for compounds that are solids under ambient temperature and pressure.

(f) U.S. EPA or OEHHA do not classify compound as a potential carcinogen, thus no published carcinogenic slope factor is available for this compound.

(g) No published chronic reference dose is available for this compound, and no suitable surrogate compound was identified.

(h) Risk-based remediation goal for lead calculated using DTSC Lead Spread Version 7.0 computer model (See Appendix B)

(i) Prefix "SAT" denotes risk -based value exceeds calculated soil saturation concentration, thus, the estimated saturation value is listed inside the parenthesis.

(j) No published human health toxicity values available for compound. Consequently, risk-based remediation goal could not be calculated for compound.

(k) No site-specific risk-based remediation goals were calculated for petroleum hydrocarbons. Fuel Storage Tank Sites Cleanup Levels derived by the Army are adopted as remediation goals for petroleum hydrocarbons. Refer to Table 7-11.

(l) The remediation goal for total chromium was calculated from the chromium (III) and chromium (IV) remediation goal assuming a 1:6 ratio of chromium(VI) to chromium(III), consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

(m Prefix "MAX" denotes that the calculated risk-based concentration is 100,000 mg/kg or greater. A non-risk based "ceiling limit" concentration for metals and certain SVOCs that are solids at ambient temperatures is given as 100,000 mg/kg, consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

TABLE 7-9
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN GROUNDWATER TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (µg/L); (a); (b)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (µg/L); (a); (b)	Lowest Remediation Goal to Protect Indoor Commercial Worker (µg/L); (c)
Metals			
Antimony	--	(d)	(f)
Arsenic	--	--	(f)
Barium	--	(d)	(f)
Beryllium	--	--	(f)
Cadmium	--	--	(f)
Chromium (III)	--	(d)	(f)
Chromium (VI)	--	--	(f)
Chromium, Total	--	--	(f)
Cobalt	--	(d)	(f)
Copper	--	(d)	(f)
Lead	--	--	(f)
Manganese	--	(d)	(f)
Mercury	--	(d)	(f)
Molybdenum	--	(d)	(f)
Nickel	--	--	(f)
Selenium	--	(d)	(f)
Silver	--	(d)	(f)
Thallium	--	(d)	(f)
Vanadium	--	(d)	(f)
Zinc	--	(d)	(f)
Volatile Organic Compounds			
1,1,2,2-tetrachloroethane	8,300,000	1,900	1,900
1,1,2-trichloroethane	230,000	2,800	2,800
1,1-dichloroethane	1,900,000	6,700	6,700
1,1-dichloroethene	33,000	(d)	33,000
1,2,3-trichloropropane	1,500,000	100	100
1,2,4-trimethylbenzene	18,000	(d)	18,000
1,2-dichloroethane	67,000	1,900	1,900
1,2-dichloropropane	16,000	110	110
1,3,5-trimethylbenzene	25,000	(d)	25,000
Acetone	86,000,000	(d)	86,000,000
Benzene	25,000	420	420
Bromodichloromethane	790,000	850	850
Carbon disulfide	230,000	(d)	230,000
Carbon tetrachloride	2,700	72	72
Chloroform	170,000	2,500	2,500

TABLE 7-9
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN GROUNDWATER TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (µg/L); (a); (b)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (µg/L); (a); (b)	Lowest Remediation Goal to Protect Indoor Commercial Worker (µg/L); (c)
Volatile Organic Compounds			
Dibromochloromethane	1,400,000	2,100	2,100
cis-1,2-dichloroethene	180,000	(d)	180,000
trans-1,2-dichloroethene	190,000	(d)	190,000
Ethylbenzene	4,200,000	(d)	4,200,000
Isopropylbenzene (Cumene)	1,800,000	(d)	1,800,000
Methyl ethyl ketone	160,000,000	(d)	160,000,000
Methyl isobutyl ketone	5,300,000	(d)	5,300,000
Methyl tertiary butyl ether	66,000,000	120,000	120,000
Methylene chloride	20,000,000	19,000	19,000
n-butylbenzene	95,000	(d)	95,000
n-propylbenzene	100,000	(d)	100,000
p-cymene (p-isopropyltoluene)	1,000,000	(d)	1,000,000
sec-butylbenzene	77,000	(d)	77,000
tert-butylbenzene	75,000	(d)	75,000
Tetrachloroethene	72,000	960	960
Toluene	1,600,000	(d)	1,600,000
Trichloroethene	61,000	2,800	2,800
Trichlorofluoromethane	2,800,000	(d)	2,800,000
Vinyl chloride	90,000	32	32
Xylenes, Total	28,000,000	(d)	28,000,000
Semi-volatile Organic Compounds			
Acenaphthene	25,000,000	(d)	25,000,000
Acenaphthylene	(e)	(d)	(g)
Anthracene	330,000,000	(d)	330,000,000
Benzidine	--	--	(f)
Benzo(a)anthracene	(e)	--	(f)
Benzo(a)pyrene	(e)	--	(f)
Benzo(b)fluoranthene	(e)	--	(f)
Benzo(b,k)fluoranthene	(e)	--	(f)
Benzo(g,h,i)perylene	(e)	(d)	(i)
Benzo(k)fluoranthene	(e)	--	(f)
Bis(2-ethylhexyl)phthalate	--	--	(f)
Chrysene	(e)	--	(f)
Dibenz(a,h)anthracene	(e)	--	(f)
Fluoranthene	--	(d)	(f)
Fluorene	38,000,000	(d)	38,000,000

TABLE 7-9
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN GROUNDWATER TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Chemical of Concern	RG_{nc} Non-carcinogenic Remediation Goal at HI = 1 (µg/L); (a); (b)	RG_c Carcinogenic Remediation Goal at Risk = 10^{-6} (µg/L); (a); (b)	Lowest Remediation Goal to Protect Indoor Commercial Worker (µg/L); (c)
Total Petroleum Hydrocarbons			
Hexachlorobutadiene	--	--	(f)
Indeno(1,2,3-c,d)pyrene	(e)	--	(f)
Naphthalene	100,000	(d)	100,000
Phenanthrene	520,000,000	(d)	520,000,000
Pyrene	200,000,000	(d)	200,000,000
Total Petroleum Hydrocarbons			
TPH Diesel	--	--	(h)
TPH Gasoline	--	--	(h)
TPH Motor Oil	--	--	(h)
TPH Recoverable	--	--	(h)
PCBs, Pesticides, and Herbicides			
Aldrin	--	--	(f)
Alpha BHC	--	--	(f)
Alpha endosulfan (Endosulfan I)	--	(d)	(f)
Alpha chlordane	--	--	(f)
Gamma chlordane	--	--	(f)
Dieldrin	--	--	(f)
Endosulfan sulfate	--	(d)	(f)
Endrin	--	(d)	(f)
Endrin aldehyde	--	(d)	(f)
Endrin ketone	--	(d)	(f)
Gamma BHC (Lindane)	--	--	(f)
Heptachlor	--	--	(f)
Heptachlor epoxide	--	--	(f)
4,4'-DDD	--	--	(f)
4,4'-DDE	--	--	(f)
4,4'-DDT	--	--	(f)
Pentachlorophenol	--	--	(f)
Toxaphene	--	--	(f)
PCB-1248 (Aroclor 1248)	(e)	--	(f)
PCB-1260 (Aroclor 1260)	(e)	--	(f)
Dioxin-like Compounds			
2,3,7,8-tetrachlorodibenzo-p-dioxin	(e)	--	(f)

TABLE 7-9
SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO PROTECT INDOOR COMMERCIAL WORKERS
Oakland Army Base, Oakland, California

Notes:

(a) Risk-based remediation goals in this table have been calculated through use of U.S. EPA Johnson and Ettinger vapor intrusion computer model. Human health toxicity values and physical and exposure parameters used in calculating remediation goals are summarized in Tables 7-1 through 7-4.

(b) Risk-based remediation goals assume a non-carcinogenic target risk level that corresponds to a hazard index of 1 and a carcinogenic target risk level of one-in-one million (i.e., 10^{-6}) incremental risk of an individual developing cancer over a lifetime from exposure to a single chemical.

(c) Unless otherwise noted, value cited is the lesser of the non-carcinogenic and carcinogenic risk-based remediation goals when both values could be calculated.

(d) U.S. EPA or OEHHA do not classify compound as a potential carcinogen, thus no published carcinogenic slope factor is available for this compound.

(e) No published chronic reference dose is available for this compound, and no suitable surrogate compound was identified.

(f) Vapor intrusion is the only potentially complete exposure pathway for this population. Consequently, risk-based remediation goals for this population are calculated only for those compounds considered to be volatile. Volatile compounds are defined to be chemicals that have Henry Law constants greater than 10^{-5} atm-m^3/mol and molecular weights less than 200 g/mol.

(g) No published human health toxicity values available for compound. Consequently, risk-based remediation goal could not be calculated for compound.

(h) No site-specific risk-based remediation goals were calculated for petroleum hydrocarbons. Fuel Storage Tank Sites Cleanup Levels derived by the Army are adopted as remediation goals for petroleum hydrocarbons. Refer to Table 7-11.

TABLE 7-10
COMPARISON OF SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO RWQCB SOIL LEACHING SCREENING LEVELS
Oakland Army Base, Oakland, California

Chemical of Concern	Lowest Remediation Goal to Protect Potentially Exposed Population (a); (b)				RWQCB Soil Leaching Screening Level (mg/kg); (c)	Lowest Goal Protecting Both Human Health and Environment (mg/kg); (d)
	Earthwork Construction Worker (mg/kg)	Indoor Commercial Worker (mg/kg)	Outdoor Industrial Worker (mg/kg)	Maintenance Personnel (mg/kg)		
Metals						
Antimony	280	(e)	(e)	7,600	(f)	280
Arsenic	20	(e)	(e)	30	(f)	20
Barium	43,000	(e)	(e)	MAX(100,000); (l)	(f)	43,000
Beryllium	1,300	(e)	(e)	16,000	(f)	1,300
Cadmium	180	(e)	(e)	150	(f)	150
Chromium (III)	MAX(100,000)	(e)	(e)	MAX(100,000)	(f)	MAX(100,000)
Chromium (VI)	86	(e)	(e)	87	(f)	86
Chromium, Total	600 (k)	(e)	(e)	610 (k)	(f)	600
Cobalt	42,000	(e)	(e)	MAX(100,000)	(f)	42,000
Copper	26,000	(e)	(e)	MAX(100,000)	(f)	26,000
Lead	3,500 (g)	(e)	(e)	77,000 (g)	(f)	3,500 (g)
Manganese	25,000	(e)	(e)	MAX(100,000)	(f)	25,000
Mercury	60	(e)	(e)	1,600	(f)	60
Molybdenum	3,500	(e)	(e)	96,000	(f)	3,500
Nickel	14,000	(e)	(e)	MAX(100,000)	(f)	14,000
Selenium	3,500	(e)	(e)	96,000	(f)	3,500
Silver	3,500	(e)	(e)	96,000	(f)	3,500
Thallium	49	(e)	(e)	1,300	(f)	49
Vanadium	4,900	(e)	(e)	MAX(100,000)	(f)	4,900
Zinc	MAX(100,000)	(e)	(e)	MAX(100,000)	(f)	MAX(100,000)
Volatile Organic Compounds						
1,1,2,2-tetrachloroethane	18	3.8	5.8	56	14	3.8
1,1,2-trichloroethane	42	2.7	11	140	17	2.7
1,1-dichloroethane	160	2.7	34	610	2.1	2.1
1,1-dichloroethene	63	43	330	SAT(710); (h)	1.7	1.7
1,2,3-trichloropropane	0.7	0.2	0.2	2.1	(f)	0.2
1,2,4-trimethylbenzene	170	470	850	SAT(5,400)	(f)	170
1,2-dichloroethane	18	0.8	3.9	71	6.2	0.8
1,2-dichloropropane	24	0.1	9.7	160	2.5	0.1
1,3,5-trimethylbenzene	87	130	440	SAT(1,300)	(f)	87
Acetone	2,700	10,000	16,000	120,000	0.5	0.5
Benzene	8.5	0.3	1.8	34	2.1	0.3
Bromodichloromethane	12	0.7	2.7	40	11	0.7
Carbon disulfide	1,200	950	SAT(1,600)	SAT(1,600)	(f)	950
Carbon tetrachloride	3	0.1	0.6	12	2.1	0.1
Chloroform	64	1.5	15	230	0.9	0.9

TABLE 7-10
COMPARISON OF SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO RWQCB SOIL LEACHING SCREENING LEVELS
Oakland Army Base, Oakland, California

Chemical of Concern	Lowest Remediation Goal to Protect Potentially Exposed Population (a); (b)				RWQCB Soil Leaching Screening Level (mg/kg); (c)	Lowest Goal Protecting Both Human Health and Environment (mg/kg); (d)
	Earthwork Construction Worker (mg/kg)	Indoor Commercial Worker (mg/kg)	Outdoor Industrial Worker (mg/kg)	Maintenance Personnel (mg/kg)		
Volatile Organic Compounds						
Dibromochloromethane	32	2	8.4	110	530	2
cis-1,2-dichloroethene	140	83	750	SAT(3,700)	18	18
trans-1,2-dichloroethene	190	95	990	SAT(7,100)	38	38
Ethylbenzene	SAT(1,200)	SAT(1,200)	SAT(1,200)	SAT(1,200)	24	24
Isopropylbenzene (Cumene)	SAT(3,800)	SAT(3,800)	SAT(3,800)	SAT(3,800)	(f)	SAT(3,800)
Methyl ethyl ketone	12,000	32,000	SAT(49,000)	SAT(49,000)	13	13
Methyl isobutyl ketone	1,500	1,200	SAT(5,500)	SAT(5,500)	3.8	3.8
Methyl tertiary butyl ether	850	33	190	3,200	1	1
Methylene chloride	180	4.8	50	650	34	4.8
n-butylbenzene	550	1,600	SAT(3,300)	SAT(3,300)	(f)	550
n-propylbenzene	350	530	SAT(1,200)	SAT(1,200)	(f)	350
p-cymene (p-isopropyltoluene)	SAT(3,700)	SAT(3,700)	SAT(3,700)	SAT(3,700)	(f)	SAT(3,700)
sec-butylbenzene	320	200	2,000	SAT(4,000)	(f)	200
tert-butylbenzene	290	300	SAT(530)	SAT(530)	(f)	290
Tetrachloroethene	65	2.8	20	220	19	2.8
Toluene	2,700	3,900	SAT(3,900)	SAT(3,900)	8.4	8.4
Trichloroethene	93	2.5	20	390	29	2.5
Trichlorofluoromethane	SAT(4,300)	3,600	SAT(4,300)	SAT(4,300)	(f)	3,600
Vinyl chloride	0.6	0.05	0.1	2.5	0.8	0.05
Xylenes, Total	SAT(1,200)	SAT(1,200)	SAT(1,200)	SAT(1,200)	1	1
Semi-volatile Organic Compounds						
Acenaphthene	8,000	MAX(100,000)	MAX(100,000)	MAX(100,000)	16	16
Acenaphthylene	(i)	(i)	(i)	(i)	120	120
Anthracene	39,000	MAX(100,000)	MAX(100,000)	MAX(100,000)	2.9	2.9
Benzidine	0.02	(e)	(e)	0.04	(f)	0.02
Benzo(a)anthracene	7.6	(e)	(e)	18	12	7.6
Benzo(a)pyrene	0.8	(e)	(e)	1.8	130	0.8
Benzo(b)fluoranthene	7.6	(e)	(e)	18	640	7.6
Benzo(b,k)fluoranthene	7.6	(e)	(e)	18	(f)	7.6
Benzo(g,h,i)perylene	(i)	(i)	(i)	(i)	5.3	5.3
Benzo(k)fluoranthene	7.6	(e)	(e)	18	37	7.6
Bis(2-ethylhexyl)phthalate	SAT(100)	(e)	(e)	SAT(100)	530	SAT(100)
Chrysene	86	(e)	(e)	200	4.7	4.7
Dibenz(a,h)anthracene	2.2	(e)	(e)	5.4	140	2.2
Fluoranthene	5,100	(e)	(e)	MAX(100,000)	60	60
Fluorene	5,100	MAX(100,000)	MAX(100,000)	MAX(100,000)	5.1	5.1

TABLE 7-10
COMPARISON OF SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO RWQCB SOIL LEACHING SCREENING LEVELS
Oakland Army Base, Oakland, California

Chemical of Concern	Lowest Remediation Goal to Protect Potentially Exposed Population (a); (b)				RWQCB Soil Leaching Screening Level (mg/kg); (c)	Lowest Goal Protecting Both Human Health and Environment (mg/kg); (d)
	Earthwork Construction Worker (mg/kg)	Indoor Commercial Worker (mg/kg)	Outdoor Industrial Worker (mg/kg)	Maintenance Personnel (mg/kg)		
Semi-volatile Organic Compounds						
Hexachlorobutadiene	49	(e)	(e)	340	46	46
Indeno(1,2,3-c,d)pyrene	7.6	(e)	(e)	18	72	7.6
Naphthalene	150	3,900	820	15,000	4.9	4.9
Phenanthrene	38,000	MAX(100,000)	MAX(100,000)	MAX(100,000)	11	11
Pyrene	3,900	MAX(100,000)	MAX(100,000)	MAX(100,000)	55	55
Total Petroleum Hydrocarbons						
TPH Diesel	--	--	--	--	--	(j)
TPH Gasoline	--	--	--	--	--	(j)
TPH Motor Oil	--	--	--	--	--	(j)
TPH Recoverable	--	--	--	--	--	(j)
PCBs, Pesticides, and Herbicides						
Aldrin	1.2	(e)	(e)	2.1	5	1.2
Alpha BHC	7.1	(e)	(e)	13	(f)	7.1
Alpha endosulfan (Endosulfan I)	1,300	(e)	(e)	69,000	(f)	1,300
Alpha chlordane	16	(e)	(e)	29	(f)	16
Gamma chlordane	16	(e)	(e)	29	(f)	16
Dieldrin	1.3	(e)	(e)	2.3	0.002	0.002
Endosulfan sulfate	1,500	(e)	(e)	73,000	(f)	1,500
Endrin	90	(e)	(e)	4,000	0.0006	0.0006
Endrin aldehyde	91	(e)	(e)	4,000	(f)	91
Endrin ketone	91	(e)	(e)	4,000	(f)	91
Gamma BHC (Lindane)	17	(e)	(e)	32	(f)	17
Heptachlor	4.1	(e)	(e)	8.2	0.013	0.013
Heptachlor epoxide	3.8	(e)	(e)	6.8	0.014	0.014
4,4'-DDD	89	(e)	(e)	160	750	89
4,4'-DDE	54	(e)	(e)	100	1,100	54
4,4'-DDT	63	(e)	(e)	110	4.3	4.3
Pentachlorophenol	260	(e)	(e)	460	42	42
Toxaphene	1.4	(e)	(e)	5.3	(f)	1.4
PCB-1248 (Aroclor 1248)	1.8	(e)	(e)	4.4	6.3	1.8
PCB-1260 (Aroclor 1260)	1.8	(e)	(e)	4.4	6.3	1.8
Dioxin-like Compounds						
2,3,7,8-tetrachlorodibenzo-p-dioxi	0.0001	(e)	(e)	0.0002	(f)	0.0001

TABLE 7-10
COMPARISON OF SITE-SPECIFIC RISK-BASED REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SOIL TO RWQCB SOIL LEACHING SCREENING LEVELS
Oakland Army Base, Oakland, California

Notes:

(a) Unless otherwise noted, values cited are the human health risk-based remediation goals that protect the potentially exposed population listed from non-carcinogenic effects and carcinogenic effects of chemicals of concern. Remediation goals for earthwork construction workers, indoor commercial workers, outdoor industrial workers, and maintenance personnel are summarized in Tables 7-5 through 7-8, respectively.

(b) Risk-based remediation goals assume a non-carcinogenic target risk level that corresponds to a hazard index of 1 and a carcinogenic target risk level of one-in-one million (i.e., 10^{-6}) incremental risk of an individual developing cancer over a lifetime from exposure to a single chemical.

(c) Soil Leaching Screening Levels listed are for the protection of groundwater that is not potential drinking water supply such as the brackish groundwater found beneath the OARB. Soil Leaching Screening Levels are compiled from RWQCB, December 2001, *Application of Risk-Based Screening Levels and Decision Making to Sites with Impacted Soil and Groundwater, Volume 2: Background Documentation for the Development of Tier 1 Soil and Groundwater Screening Levels*, Interim Final, San Francisco Bay Region.

(d) Unless otherwise noted, goals listed are the lowest values of the risk-based remediation goals that protect identified potentially exposed populations and the RWQCB Soil Leaching Screening Levels intended to minimize degradation of groundwater that is not potential drinking water supply.

(e) Vapor intrusion is the only potentially complete exposure pathway for this population. Consequently, risk-based remediation goals for this population are calculated only for those compounds considered to be volatile. Volatile compounds are defined to be chemicals that have Henry Law constants greater than 10^{-5} atm-m^3/mol and molecular weights less than 200 g/mol.

(f) No Soil Leaching Screening Level listed for this compound in RWQCB RBSL guidance (RWQCB, 2001).

(g) Risk-based remediation goal for lead calculated using DTSC Lead Spread Version 7.0 computer model (See Appendix B).

(h) Prefix "SAT" denotes risk-based value exceeds calculated soil saturation concentration, thus, the estimated saturation value is listed inside the parenthesis.

(i) No published human health toxicity values available for compound. Consequently, risk-based remediation goal could not be calculated for compound.

(j) No site-specific risk-based remediation goals were calculated for petroleum hydrocarbons. Fuel Storage Tank Sites Cleanup Levels derived by the Army are adopted as remediation goals for petroleum hydrocarbons. Refer to Table 7-11.

(k) The remediation goal for total chromium was calculated from the chromium (III) and chromium (IV) remediation goal assuming a 1:6 ratio of chromium(VI) to chromium(III), consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

(l) Prefix "MAX" denotes that the calculated risk-based concentration is 100,000 mg/kg or greater. A non-risk based "ceiling limit" concentration for metals and certain SVOCs that are solids at ambient temperatures is given as 100,000 mg/kg, consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

TABLE 7-11
REMEDIATION GOALS FOR CHEMICALS OF CONCERN
IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Soil Remediation Goal at HI=1 or Risk = 10^{-6} (mg/kg)	Population or Pathway Governing Soil Remediation Goal (see Table 7-10)	Groundwater Remediation Goal at HI=1 or Risk = 10^{-6} (µg/L)
Metals			
Antimony	280	Construction Worker	(a)
Arsenic	20	Construction Worker	(a)
Barium	43,000	Construction Worker	(a)
Beryllium	1,300	Construction Worker	(a)
Cadmium	150	Construction Worker	(a)
Chromium (III)	MAX(100,000); (f)	--	(a)
Chromium (VI)	86	Construction Worker	(a)
Chromium, Total	600 (e)	Construction Worker	(a)
Cobalt	42,000	Construction Worker	(a)
Copper	26,000	Construction Worker	(a)
Lead	750 (h)	See Note (h)	(a)
Manganese	25,000	Construction Worker	(a)
Mercury	60	Construction Worker	(a)
Molybdenum	3,500	Construction Worker	(a)
Nickel	14,000	Construction Worker	(a)
Selenium	3,500	Construction Worker	(a)
Silver	3,500	Construction Worker	(a)
Thallium	49	Construction Worker	(a)
Vanadium	4,900	Construction Worker	(a)
Zinc	MAX(100,000)	--	(a)
Volatile Organic Compounds			
1,1,2,2-tetrachloroethane	3.8	Leaching to Groundwater (b)	1,900
1,1,2-trichloroethane	2.7	Indoor Worker	2,800
1,1-dichloroethane	2.1	Leaching to Groundwater (b)	6,700
1,1-dichloroethene	1.7	Leaching to Groundwater (b)	33,000
1,2,3-trichloropropane	0.2	Indoor Worker	100
1,2,4-trimethylbenzene	170	Construction Worker	18,000
1,2-dichloroethane	0.8	Indoor Worker	1,900
1,2-dichloropropane	0.1	Indoor Worker	110
1,3,5-trimethylbenzene	87	Construction Worker	25,000
Acetone	0.5	Leaching to Groundwater (b)	86,000,000
Benzene	0.3	Indoor Worker	420
Bromodichloromethane	0.7	Indoor Worker	850
Carbon disulfide	950	Indoor Worker	230,000
Carbon tetrachloride	0.1	Indoor Worker	72
Chloroform	0.9	Leaching to Groundwater (b)	2,500

TABLE 7-11
REMEDIATION GOALS FOR CHEMICALS OF CONCERN
IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Soil Remediation Goal at HI=1 or Risk = 10^{-6} (mg/kg)	Population or Pathway Governing Soil Remediation Goal (see Table 7-10)	Groundwater Remediation Goal at HI=1 or Risk = 10^{-6} (µg/L)
Volatile Organic Compounds			
Dibromochloromethane	2.0	Leaching to Groundwater (b)	2,100
cis-1,2-dichloroethene	18	Leaching to Groundwater (b)	180,000
trans-1,2-dichloroethene	38	Leaching to Groundwater (b)	190,000
Ethylbenzene	24	Leaching to Groundwater (b)	4,200,000
Isopropylbenzene (Cumene)	SAT(3,800); (g)	--	1,800,000
Methyl ethyl ketone	13	Leaching to Groundwater (b)	160,000,000
Methyl isobutyl ketone	4	Leaching to Groundwater (b)	5,300,000
Methyl tertiary butyl ether	1	Leaching to Groundwater (b)	120,000
Methylene chloride	4.8	Leaching to Groundwater (b)	19,000
n-butylbenzene	550	Construction Worker	95,000
n-propylbenzene	350	Construction Worker	100,000
p-cymene (p-isopropyltoluene)	SAT(3,700)	--	1,000,000
sec-butylbenzene	200	Leaching to Groundwater (b)	77,000
tert-butylbenzene	290	Construction Worker	75,000
Tetrachloroethene	2.8	Leaching to Groundwater (b)	960
Toluene	8.4	Leaching to Groundwater (b)	1,600,000
Trichloroethene	2.5	Indoor Worker	2,800
Trichlorofluoromethane	3,600	Indoor Worker	2,800,000
Vinyl chloride	0.05	Indoor Worker	32
Xylenes, Total	1	Indoor Worker	28,000,000
Semi-volatile Organic Compounds			
Acenaphthene	16	Leaching to Groundwater (b)	25,000,000
Acenaphthylene	120	Leaching to Groundwater (b)	(a)
Anthracene	2.9	Leaching to Groundwater (b)	330,000,000
Benzidine	0.02	Construction Worker	(a)
Benzo(a)anthracene	7.6	Construction Worker	(a)
Benzo(a)pyrene	0.8	Construction Worker	(a)
Benzo(b)fluoranthene	7.6	Construction Worker	(a)
Benzo(b,k)fluoranthene	7.6	Construction Worker	(a)
Benzo(g,h,i)perylene	5.3	Leaching to Groundwater (b)	(a)
Benzo(k)fluoranthene	7.6	Construction Worker	(a)
Bis(2-ethylhexyl)phthalate	SAT(100)	--	(a)
Chrysene	4.7	Leaching to Groundwater (b)	(a)
Dibenz(a,h)anthracene	2.2	Construction Worker	(a)
Fluoranthene	60	Leaching to Groundwater (b)	(a)
Fluorene	5.1	Leaching to Groundwater (b)	38,000,000

TABLE 7-11
REMEDIATION GOALS FOR CHEMICALS OF CONCERN
IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Chemical of Concern	Soil Remediation Goal at HI=1 or Risk = 10^{-6} (mg/kg)	Population or Pathway Governing Soil Remediation Goal (see Table 7-10)	Groundwater Remediation Goal at HI=1 or Risk = 10^{-6} (µg/L)
Semi-volatile Organic Compounds			
Hexachlorobutadiene	46	Leaching to Groundwater (b)	(a)
Indeno(1,2,3-c,d)pyrene	7.6	Construction Worker	(a)
Naphthalene	4.9	Leaching to Groundwater (b)	100,000
Phenanthrene	11	Leaching to Groundwater (b)	520,000,000
Pyrene	55	Leaching to Groundwater (b)	200,000,000
Total Petroleum Hydrocarbons			
TPH Diesel	8,000 (c)	See Note (c)	9,600 (c)
TPH Gasoline	2,400 (c)	See Note (c)	7,280 (c)
TPH Motor Oil	58,000 (c)	See Note (c)	(a)
TPH Recoverable	(d)	--	(a)
PCBs, Pesticides, and Herbicides			
Aldrin	1.2	Construction Worker	(a)
Alpha BHC	7.1	Construction Worker	(a)
Alpha endosulfan (Endosulfan I)	1,300	Construction Worker	(a)
Alpha chlordane	16	Construction Worker	(a)
Gamma chlordane	16	Construction Worker	(a)
Dieldrin	0.002	Leaching to Groundwater (b)	(a)
Endosulfan sulfate	1,500	Construction Worker	(a)
Endrin	0.001	Leaching to Groundwater (b)	(a)
Endrin aldehyde	91	Construction Worker	(a)
Endrin ketone	91	Construction Worker	(a)
Gamma BHC (Lindane)	17	Construction Worker	(a)
Heptachlor	0.013	Leaching to Groundwater (b)	(a)
Heptachlor epoxide	0.014	Leaching to Groundwater (b)	(a)
4,4'-DDD	89	Construction Worker	(a)
4,4'-DDE	54	Construction Worker	(a)
4,4'-DDT	4.3	Leaching to Groundwater (b)	(a)
Pentachlorophenol	42	Leaching to Groundwater (b)	(a)
Toxaphene	1.4	Construction Worker	(a)
PCB-1248 (Aroclor 1248)	1.8	Construction Worker	(a)
PCB-1260 (Aroclor 1260)	1.8	Construction Worker	(a)
Dioxin-like Compounds			
2,3,7,8-tetrachlorodibenzo-p-dioxin	0.0001	Construction Worker	(a)

TABLE 7-11
REMEDIATION GOALS FOR CHEMICALS OF CONCERN
IN SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

Notes:

(a) Vapor intrusion is the only potentially complete exposure pathway for COCs in groundwater. Consequently, as described in Table 7-9, risk-based remediation goals for non-volatile compounds in groundwater were not calculated. However, the narrative goal is to prevent further significant increases of metals and other non-volatile COC concentrations in groundwater.

(b) A more detailed evaluation should be considered if remediation goals based on leaching to groundwater govern the need for future remediation at RAP sites or RMP locations.

(c) The Army's Fuel Storage Tank Sites Cleanup Levels (IT, 2000n) have been adopted as the site-specific remediation goals for petroleum hydrocarbons in soil and groundwater at the OARB.

(d) No site-specific goal established for "TPH recoverable," which is general considered to be weathered, high molecular weight residual TPH. TPH recoverable is normally managed to control nuisance conditions (e.g., odor or deficiency of impacted soil for structural purposes).

(e) The remediation goal for total chromium was calculated from the chromium (III) and chromium (IV) remediation goal assuming a 1:6 ratio of chromium(VI) to chromium(III), consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

(f) Prefix "MAX" denotes that the calculated risk-based concentration is 100,000 mg/kg or greater. A non-risk based "ceiling limit" concentration for metals and certain SVOCs that are solids at ambient temperatures is given as 100,000 mg/kg, consistent with U.S. EPA Region IX Preliminary Remediation Goals (U.S. EPA, 2000).

(g) Prefix "SAT" denotes risk-based value exceeds calculated soil saturation concentration, thus, the estimated saturation value is listed inside the parenthesis.

(h) The U.S. EPA Region IX Preliminary Remediation Goal (U.S. EPA, 2000) has been adopted as the site-specific remediation goal for lead in soil.

TABLE 8-1
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
No Action			No Action.	Required for consideration by NCP.
Institutional Controls			Oakland Army Base ("OARB") land use would be restricted or controlled by administrative procedures and/or requirements to follow a risk management plan.	Potentially applicable in conjunction with engineering controls.
Monitored Natural Attenuation			Routine inspections alone or in conjunction with ongoing groundwater sampling are performed to assess impacts on environmental conditions at the OARB.	Potentially applicable in conjunction with engineering controls.
Containment	Permeable Cover Systems		Applicable to soil with chemicals of concern ("COCs") that are not mobile or do not present a significant risk to groundwater. Clean soil or other suitable cover materials (e.g., asphalt, building slabs, concrete walk-ways) are used to minimize the potential for humans and ecological receptors to contact soil containing COCs.	Potentially applicable.
	Low Permeability Cover Systems	Vapor Barrier	Low permeability geomembrane is placed below building foundations to limit volatilization of COCs from soil or groundwater into buildings or to prevent leaching of potentially mobile COCs from soil to groundwater.	Potentially applicable.

TABLE 8-1
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
In-situ Soil Treatment	Physical/Chemical Technology	Soil Flushing	Water, surfactant, or organic solvents are injected into soil to remove COCs. Technology requires extraction system to recover fluid used to flush soil.	Not retained. Not demonstrated. In-situ fluid recovery difficult to accomplish.
		Immobilization	Cement or other chemical agents are injected and mixed with soil to immobilize COCs. Includes stabilization and solidification technologies.	Retain for possible future use. In-situ mixing difficult to verify, residual chemicals not addressed.
		Soil Vapor Extraction	Vacuum is applied to soil to remove volatile COCs for subsequent treatment in most applications.	Retain for possible future use. No significant VOC source material currently identified in soil to date.
		Sub-slab Depressurization	A slight vacuum is maintained beneath the building to overcome pressure gradient pulling volatile chemicals into the building.	Potentially applicable.
		Electrokinetics	Conductive solution is injected into soil to mobilize COCs. Electrical current is applied across soil to cause COCs to migrate to the anodes or cathodes inserted into the subsurface. Technology requires extraction system to recover conductive solution injected into soil.	Not retained. Not demonstrated. In-situ fluid recovery difficult to accomplish.
	Thermal Technology	Vitrification	Heat or electric current is applied to melt soil and to incorporate metals into vitrified mass.	Not retained. Cost and availability of equipment limit implementation.
	Biological Technology	Phytoremediation	Plants established in soil uptake COCs and incorporate the chemicals in their plant structure. Plants are subsequently harvested for disposal at an off-site, permitted waste management facility, if needed.	Retain for possible future use. Plants not compatible with planned commercial/industrial land use.
		Bioremediation	Oxygen, water, and/or nutrients are supplied in-situ to soil to stimulate degradation of petroleum hydrocarbons or other organic chemicals by indigenous microorganisms.	Retain for possible future use. Multiple small sites are not cost-effectively addressed by this technology.

TABLE 8-1
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
Soil Excavation			Soil is excavated using standard construction techniques.	Potentially applicable.

TABLE 8-1
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
Ex-situ Soil Treatment	Physical/Chemical Technology	Soil Washing	Water, surfactant, or organic solvents are used to leach COCs from soil.	Retain for possible future use. Difficult to implement.
		Chemical Oxidation/ Reduction	Chemicals are mixed with soil to oxidize or reduce COCs to less toxic forms.	Not retained. Not demonstrated. Difficult to implement.
		Immobilization	Soil is screened to remove oversize wastes and debris. Cement or other chemical reagents are mixed with soil to solidify or stabilize COCs.	Potentially applicable.
	Thermal Technology	Thermal Desorption	Soil is heated to volatilize COCs for subsequent treatment in most applications.	Retain for possible future use. Expensive to implement.
		Vitrification	Heat or electric current is applied to melt soil and to incorporate metals into vitrified mass.	Not retained. Cost and availability of equipment limit implementation.
		Incineration	Soil is burned at high temperatures, destroying organic compounds. Metals volatilize or remain in ash.	Not retained. Expensive to implement.
	Biological Technology	Phytoremediation	Plants established in soil uptake COCs and incorporate the chemicals in their plant structure. Plants are subsequently harvested for disposal at an off-site, permitted waste management facility.	Not retained.
		Bioremediation	Oxygen, water, and/or nutrients are supplied ex-situ to soil to stimulate degradation of petroleum hydrocarbons or other organic chemicals by microorganisms.	Potentially applicable.

TABLE 8-1
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
Excavated Soil Management	Disposal of Soil On-site		Soil is treated such that COCs are below site-specific remedial goals. Soil is reused on-site.	Potentially applicable.
	Disposal of Soil Off-site		Soil containing COCs is transported to and disposed at an off-site, permitted waste management facility.	Potentially applicable.

TABLE 8-2
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
No Action			No Action.	Required for consideration by NCP.
Institutional Controls			Uses of Oakland Army Base ("OARB") sites and groundwater are restricted or controlled by administrative procedures and/or requirements to follow a risk management plan.	Potentially applicable in conjunction with monitoring or engineering controls.
Monitored Natural Attenuation			Routine inspections alone or in conjunction with ongoing groundwater sampling are performed to assess environmental conditions at the OARB and to enforce groundwater restrictions.	Potentially applicable.
Groundwater Diversion	Subsurface Barriers	Slurry Wall	Slurry walls or grout curtains are created by injecting or placing a soil-bentonite or cement-bentonite mixture into the subsurface. Slurry walls are used to divert groundwater flow.	Retain for possible future use. Slurry walls need competent foundation for bottom key and are expensive.
		Sheet Piling	Low permeability vertical barrier created by vibrating or otherwise installing sheet piling into the subsurface. Sheet piling is used to divert groundwater flow.	Not retained. Groundwater flow is minimal at OARB. May be used temporarily for construction dewatering.

TABLE 8-2
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
In-situ Groundwater Treatment	Physical/Chemical Technology	Air Sparging	Air sparging, recirculating wells, or other means cause volatile chemicals of concern ("COCs") in groundwater to partition into an air stream that is collected through soil vapor extraction for subsequent treatment in most applications.	Potentially applicable.
		Permeable Reactive Walls	Groundwater is directed into subsurface units or "walls" that contain zero-valent iron or other reactive medium that converts COCs to less toxic forms.	Retain for possible future use. Groundwater gradient at OARB does not generate significant groundwater flow through wall, expensive pumping may be required.
		Chemical Oxidation/ Reduction	Chemicals are injected or otherwise introduced to groundwater to oxidize or reduce COCs to less toxic forms.	Potentially applicable.
	Biological Technology	Bioremediation	Enhanced bioremediation can be performed under both aerobic (i.e., presence of oxygen) and anaerobic (i.e., absence of oxygen) conditions. Under aerobic conditions, oxygen and nutrients are supplied in-situ to groundwater containing COCs to stimulate degradation of organic chemicals by indigenous microorganisms. Petroleum hydrocarbons and many other organic chemicals are amenable to aerobic bioremediation. Under anaerobic conditions, nutrients are supplied in-situ to groundwater containing COCs to stimulate degradation of organic chemicals by indigenous microorganisms. Some chlorinated organic solvents are amenable to anaerobic bioremediation.	Potentially applicable.

TABLE 8-2
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
Groundwater Extraction	Wells		Migration of COCs in groundwater is controlled by extracting impacted groundwater. Groundwater is removed from the subsurface by mechanical pumps placed in vertical wells.	Potentially applicable.
	Trenches		Migration of COCs in groundwater is controlled by extracting impacted groundwater. Groundwater is collected as it flows into trenches. The water is pumped from sumps in the bottom of the trenches to the above grade collection point.	Potentially applicable.

TABLE 8-2
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
Ex-situ Groundwater Treatment	Physical/Chemical Technologies	Air Stripping	Air stripping causes volatile COCs to partition from water to an air stream. Subsequent treatment of air stream may be required.	Potentially applicable.
		Adsorption	COCs are adsorbed onto granular activated carbon or resin beds.	Potentially applicable.
		Membrane Separation	Reverse osmosis, ultrafiltration, or electrodialysis employ membranes to separate COCs from water.	Not retained. Expensive, brine requires subsequent treatment and disposal.
		Precipitation/Coagulation	Chemicals are supplied to water to convert COCs to insoluble forms which are then filtered, settled, or otherwise removed from water.	Not retained for possible future use. Not all COCs at OARB can be removed by this process.
		Ion Exchange	Chemical treatment by ion exchange captures ionic COCs on a resin bed.	Not retained. Same limitations as for precipitation / coagulation.
		Advanced Oxidation	Ultraviolet light, hydrogen peroxide, or ozone alone or in combination are supplied to water to destroy or convert COCs to less toxic forms.	Potentially applicable.
	Biological Technologies	Bioremediation	Oxygen and/or nutrients are supplied to water containing COCs to stimulate degradation of petroleum hydrocarbons or organic chemicals by microorganisms.	Not retained. Not all COCs at OARB can be removed by this process.

TABLE 8-2
SCREENING SUMMARY OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER

Oakland Army Base, Oakland, California

General Response Action	Remedial Technology	Process Option	Description	Screening Status
Extracted Groundwater Management	~~Reclamation~~		Reuse water for irrigation, pond, or other use on site.	Not retained. No reuse opportunities exist at OARB.
	~~Discharge to Sanitary Sewer~~		Discharge of collected water to East Bay Municipal Utility District Publicly Owned Treatment Works ("POTW") under permit.	Not retained. Unlikely to be appropriate for discharge of water containing COCs, due to local restrictions limiting discharge of groundwater to sewers.
	Discharge to Storm Drain		Discharge of collected water to surface water under National Pollutant Discharge Elimination System ("NPDES") permit.	Potentially applicable.

TABLE 9-1
SCREENING OF OARB REMEDIAL ALTERNATIVES (a); (b)

Oakland Army Base, Oakland, California

Soil Process Option	Water Process Option	Effectiveness	Implementability	Cost	Status
No Action	No Action	Does not achieve remedial action objectives for sites with chemicals of concern ("COCs") in soil and groundwater above applicable remedial goals.	Easily implemented.	Negligible cost.	Retained. Required for consideration by NCP.
Institutional Controls	Institutional Controls	Effective to restrict land and groundwater use, and to follow Risk Managemetn Plan	Easily implemented.	Low capital cost, low to moderate annual cost.	Retained.
	Monitored Natural Attenuation	Monitoring is effective to demonstrate compliance with remedial goals.	Easily implemented.	Low capital cost, low to moderate annual cost.	Retained.
	In-situ Oxidation/ Reduction Monitoring	Likely to reduce concentrations of COCs in groundwater by oxidation or reduction. Monitoring is effective to evaluate performance of remedial actions.	Implementation is a function of accessibility to groundwater.	Low to moderate capital cost, low to moderate annual cost.	Retained.
	In-situ Bioremediation Monitoring	Likely to reduce concentrations of COCs in soil or groundwater by bioremediation. Monitoring is effective to evaluate performance of remedial actions.	Implementation is a function of accessibility to soil and groundwater.	Low to moderate capital cost, low to moderate annual cost.	Retained.

TABLE 9-1
SCREENING OF OARB REMEDIAL ALTERNATIVES (a); (b)

Oakland Army Base, Oakland, California

Soil Process Option	Water Process Option	Effectiveness	Implementability	Cost	Status
	Groundwater Extraction Ex-situ Groundwater Treatment Discharge to Storm Drain Monitor	Could maintain hydraulic containment of impacted groundwater.	Can be implemented with standard equipment. NPDES discharge permit required.	Moderate to high capital cost, moderate to high annual cost.	Retain for possible future use. Hydraulic control not necessary to control groundwater at OARB. These processes are more costly and may not be as effective as in-situ treatment alternatives.
	Air Sparging Monitor	Could volatize chemicals, off-gas treatment may be necessary.	Extensive equipment requirements could hinder redevelopment activities.	Moderate to high capital cost, moderate to high annual cost.	Retain for possible future use. These processes are more costly and may not be as effective as in-situ chemical addition alternatives.

TABLE 9-1
SCREENING OF OARB REMEDIAL ALTERNATIVES (a); (b)

Oakland Army Base, Oakland, California

Soil Process Option	Water Process Option	Effectiveness	Implementability	Cost	Status
Vapor Barrier	Monitoring	Likely to limit volatilization of COCs into buildings with intact barriers. Monitoring is effective to evaluate performance of remedial actions.	Can be easily implemented during building construction. Difficult to implement on existing buildings.	Low to moderate capital cost, low to moderate annual cost.	Retained.
Vapor Barrier Sub-slab Depressurization	Monitoring	Likely to limit volatilization of COCs into buildings by capture of soil gases to enhance effectiveness of barrier. Monitoring is effective to evaluate performance of remedial actions.	Can be easily implemented during building construction. Difficult to implement on existing buildings.	Moderate capital cost, moderate annual cost.	Retained.
Soil Excavation Ex-Situ Bioremediation Dispose of Soil On-site	Monitoring	Ex-situ biodegredation would effectively degrade petroleum hydrocarbons and fuel constituents, but small volumes cannot be treated cost-effectively .	Implementation requires extended time and area to treat soil. May limit redevelopment of areas used for treatment.	Low to moderate capital cost, low to moderate annual cost.	Retain for possible future use. No large volume of petroleum hydrocarbon impacted soil has been identified to date. Small treatment volumes over an extended time are not cost-effective.

TABLE 9-1
SCREENING OF OARB REMEDIAL ALTERNATIVES (a); (b)

Oakland Army Base, Oakland, California

Soil Process Option	Water Process Option	Effectiveness	Implementability	Cost	Status
Soil Excavation Dispose of Soil Off-site	Monitoring (As Needed)	Complete removal of soil is likely to achieve applicable remedial goals for soil. Groundwater monitoring would be included only if groundwater issues identified.	Readily implemented with standard construction equipment.	Low to high capital cost, depending on the volume of soil to be managed. Low annual cost.	Retained.
Soil Excavation Dispose of Soil Off-site	In-situ Groundwater Treatment Monitoring	Groundwater treatment of residuals after impacted soil removal is generally more effective. Monitoring is effective to evaluate performance of remedial actions.	Readily implemented with standard construction equipment.	Moderate to high capital cost, low to moderate annual cost.	Retained.
Soil Excavation Ex-situ Immobilization Disposal of Soil Off-site	Monitoring	Immobilization of soil may be effective to allow waste or soil containing oily residue to be transported for off-site disposal. Monitoring is effective to evaluate performance of remedial actions.	Implementation depends the nature and characteristics of the oily residue. A land disposal restriction variance is also likely to be required to implement this alternative.	High capital cost, low annual cost. On-site immobilization may be required for off-site disposal of some oily residue waste to minimize free liquids or pH extremes.	Retained.

Notes:

(a) Institutional controls such as restrictions on on-site groundwater use and land use are an inherent component of all alternatives for planned commercial and industrial redevelopment of OARB. Land use restrictions include construction or maintenance of the existing site-wide asphalt or concrete pavement, building slab, or other engineered structure that minimize direct contact of impacted soil by commercial and industrial workers, as well as, implementation of Risk Management Plan ("RMP") protocols.

(b) Additional investigation to confirm appropriateness and extent of remedial actions may also be included as part of design and implementation of a remedial alternative.

TABLE 9-2
SUMMARY OF POTENTIAL REMEDIAL ACTIONS
Oakland Army Base, Oakland, California

Site	Alternative	Remedial Alternatives for Detailed Analysis (a); (b)									
		No Action for Soil and Groundwater	Institutional Controls	Monitored Natural Attenuation	Perform In-situ Chemical Oxidation/ Reduction of COCs in Groundwater, and Monitor Groundwater	Perform In-situ Bioremediation of COCs in Groundwater, Monitor Groundwater	Install Vapor Barrier Beneath New Building and Monitor Groundwater	Install Vapor Barrier with Sub-slab Depressurization System Beneath New Building and Monitor Groundwater	Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed (c)	Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment and Monitor Groundwater	Excavate, Conduct Ex-situ Immobilization, and Dispose of Soil Off-site, and Monitor Groundwater
RAP Sites											
• Former ORP/Building 1 Area (d)	1	●									
	2		●								●
• VOCs in Groundwater at the Eastern End of Building 807	1	●									
	2		●	●							
	3		●		●						
• VOCs in Groundwater Near Buildings 808 and 823	1	●									
	2		●	●							
	3		●			●					
	4		●				●				
	5		●					●			
• VOCs in Groundwater Near Building 99	1	●									
	2		●	●							
	3		●			●					
	4		●				●				
	5		●					●			
• Benzene and MTBE in Groundwater Near Former USTs 11A/12A/13A	1	●									
	2		●						●		
	3		●							●	

TABLE 9-2
SUMMARY OF POTENTIAL REMEDIAL ACTIONS
Oakland Army Base, Oakland, California

Site	Alternative	Remedial Alternatives for Detailed Analysis (a); (b)									
		No Action for Soil and Groundwater	Institutional Controls	Monitored Natural Attenuation	Perform In-situ Chemical Oxidation/ Reduction of COCs in Groundwater, and Monitor Groundwater	Perform In-situ Bioremediation of COCs in Groundwater, Monitor Groundwater	Install Vapor Barrier Beneath New Building and Monitor Groundwater	Install Vapor Barrier with Sub-slab Depressurization System Beneath New Building and Monitor Groundwater	Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed (c)	Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment and Monitor Groundwater	Excavate, Conduct Ex-situ Immobilization, and Dispose of Soil Off-site, and Monitor Groundwater
RAP Sites											
• Building 991 Area	1	●									
	2		●						●		
	3		●							●	
• Building 99	1	●									
	2		●						●		
RMP Implementation Area											
• Washracks, Sumps, Oil/Water Separators, and Miscellaneous Operations	1	●									
	2		●						●		
• Tanks	1	●									
	2		●	●							
	3		●						●		
• Boiler Debris Near Building 99	1	●									
	2		●						●		
• Building 85	1	●									
	2		●						●		

TABLE 9-2
SUMMARY OF POTENTIAL REMEDIAL ACTIONS
Oakland Army Base, Oakland, California

Site	Alternative	Remedial Alternatives for Detailed Analysis (a); (b)									
		No Action for Soil and Groundwater	Institutional Controls	Monitored Natural Attenuation	Perform In-situ Chemical Oxidation/ Reduction of COCs in Groundwater, and Monitor Groundwater	Perform In-situ Bioremediation of COCs in Groundwater, Monitor Groundwater	Install Vapor Barrier Beneath New Building and Monitor Groundwater	Install Vapor Barrier with Sub-slab Depressurization System Beneath New Building and Monitor Groundwater	Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed (c)	Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment and Monitor Groundwater	Excavate, Conduct Ex-situ Immobilization, and Dispose of Soil Off-site, and Monitor Groundwater
RMP Implementation Area											
• Building 812	1	●									
	2		●						●		
• Building 823	1	●									
	2		●						●		
• Potential Drum Drainage Area East of Buildings 805 and 806	1	●									
	2		●							●	
• Former Motor Pool and Salvage Operations at Building 640	1	●									
	2		●						●		
	3		●							●	
• Benzidine at Former Used Oil Tank 21	1	●									
	2		●						●		
• Historical Spills and Stains	1	●									
	2		●						●		
• Lead in Soil Around Buildings	1	●									
	2		●						●		

TABLE 9-2
SUMMARY OF POTENTIAL REMEDIAL ACTIONS
Oakland Army Base, Oakland, California

Site	Alternative	Remedial Alternatives for Detailed Analysis (a); (b)									
		No Action for Soil and Groundwater	Institutional Controls	Monitored Natural Attenuation	Perform In-situ Chemical Oxidation/ Reduction of COCs in Groundwater, and Monitor Groundwater	Perform In-situ Bioremediation of COCs in Groundwater, Monitor Groundwater	Install Vapor Barrier Beneath New Building and Monitor Groundwater	Install Vapor Barrier with Sub-slab Depressurization System Beneath New Building and Monitor Groundwater	Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed (c)	Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment and Monitor Groundwater	Excavate, Conduct Ex-situ Immobilization, and Dispose of Soil Off-site, and Monitor Groundwater
RMP Implementation Area											
• Former PCB-Containing Transformers and Equipment Locations	1	●									
	2		●						●		
• Storm Drains and Sanitary Sewers (e)	1	●									
	2		●						●		
• Railroad Tracks (f)	1	●									
	2		●						●		
• Marine Sediments at Former Parcels 2 and 3 (g)	1	●									
	2		●								

TABLE 9-2
SUMMARY OF POTENTIAL REMEDIAL ACTIONS
Oakland Army Base, Oakland, California

Notes:

(a) The NCP at 40 CFR §300.430(e)(6) requires that the no action alternative be evaluated as a baseline for comparison of other alternatives developed. No action may be an appropriate remedial alternative for sites where concentrations of chemicals of concern ("COCs") are found to be not greater than cleanup levels for soil or groundwater.

(b) Institutional controls including on-site land and groundwater use restrictions are an inherent component of all alternatives, including maintaining existing cover or constructing new permeable cover. The existing site-wide permeable cover or new constructed cover includes asphalt or concrete pavement, building slab, or other engineered structure that minimizes contact of impacted soil by human receptors.

(c) Additional investigation is planned for many OARB sites. Remedial actions will be conducted only if impacted soil or groundwater is identified.

(d) ORP Area near Building 1 Alternative 2 includes subalternatives to potentially reuse of overburden. If the overburden cannot be reused, all materials will be disposed off-site.

(e) Storm Drain Alternative 2 includes flushing of the sediments within storm drains.

(f) Railroad Track Alternative 2 includes reusing existing ballast and covering impacted ballast identified in investigation.

(g) Remedial actions for Marine Sediments at Former Parcels 2 and 3 are essentially No Action. No action is proposed for Outfalls 5, 6, and 7. Filling as part of the Port's Berth 21 Project is planned to cover Outfalls 8 through 11. Marine sediments at Outfall 4 are designated as part of Parcel 1 and will be addressed with the Spit and Parcel 1 outfalls by separate RAP.

TABLE 9-3
SUMMARY OF KEY PARAMETERS FOR REMEDIAL ALTERNATIVES (a)
Oakland Army Base, Oakland, California

Location	Key Parameters
RAP Sites	
• Former ORP/Building 1 Area	**Common to Remedial Alternatives 2a and 2b** • Primary COCs: lead, PAHs, PCDDs, PCDFs, tarry residue • Demolition of Building 1 to be funded and completed by Army prior to transfer. No demolition costs included. • Excavate overburden soil (est. 8,700 cy) • Excavate soil with 1,2,3-trichloropropane (est. 1,800 cy) • Excavate and immobilize soil with oily residue (est. 6,000 cy) • Dispose of tarry residue off-site as RCRA hazardous waste with variance from land disposal restrictions • Monitor groundwater for 5 years **Specific to Alternative 2a** • Reuse overburden and soil with 1,2,3-trichloropropane on-site **Specific to Alternative 2b** • Dispose of overburden and soil with 1,2,3-trichloropropane off-site as non-hazardous waste
• VOCs in Groundwater at Eastern End of Building 807	**Common to Alternatives 2 and 3** • Primary COCs: VOCs, particularly vinyl chloride and TCE **Specific to Alternative 2** • Monitor groundwater for 15 years **Specific to Alternative 3** • Perform in-situ chemical oxidation/reduction of groundwater (est. 30,000 sf area of shallow groundwater impacted) • Monitor groundwater for 5 years
• VOCs in Groundwater Near Buildings 808 and 823	**Common to Alternatives 2, 3, 4, and 5** • Primary COCs: VOCs, particularly vinyl chloride **Specific to Alternative 2** • Monitor groundwater for 15 years **Specific to Alternative 3** • Perform in-situ bioremediation of groundwater (est. 40,000 sf area of shallow groundwater impacted) • Monitor groundwater for 5 years **Specific to Alternative 4** • Install vapor barrier under footprint of new building (40,000 sf) • Monitor groundwater for 15 years **Specific to Alternative 5** • Install sub-slab depressurization system with vapor barrier under footprint of new building (40,000 sf) • Monitor groundwater for 15 years

TABLE 9-3
SUMMARY OF KEY PARAMETERS FOR REMEDIAL ALTERNATIVES (a)
Oakland Army Base, Oakland, California

Location	Key Parameters
RAP Sites	
• VOCs in Groundwater Near Building 99	**Common to Alternatives 2, 3, 4, and 5** • Primary COCs: VOCs, particularly vinyl chloride and benzene **Specific to Alternative 3** • Monitor groundwater for 15 years **Specific to Alternative 3** • Perform in-situ bioremediation of groundwater (est. 22,000 sf area of shallow groundwater impacted) **Specific to Alternative 4** • Install vapor barrier under footprint of new building (40,000 sf) • Monitor groundwater for 15 years **Specific to Alternative 5** • Install sub-slab depressurization system with vapor barrier under footprint of new building (40,000 sf) • Monitor groundwater for 15 years
• Benzene and MTBE in Groundwater Near Former USTs 11A/12A/13A	**Common to Alternatives 2 and 3** • Primary COCs: petroleum hydrocarbons, benzene, MTBE **Specific to Alternative 2** • Excavate overburden (est. 170 cy) • Excavate and dispose of source soil (est. 110 cy) • Monitor groundwater for 15 years **Specific to Alternative 3** • Excavate overburden (est. 260 cy) • Excavate and dispose of source soil (est. 170 cy) • Perform in-situ bioremediation of groundwater (est. 6,300 sf area of shallow groundwater impacted) • Monitor groundwater for 5 years
• Building 991 Area	**Common to Alternatives 2 and 3** • Primary COCs: petroleum hydrocarbons and related constituents **Specific to Alternative 2** • Excavate and dispose of source soil (est. 250 cy) • Monitor groundwater for 5 years **Specific to Alternative 3** • Excavate and dispose impacted source soil (est. 500 cy) • Perform in-situ bioremediation of groundwater (est. 8,000 sf area of shallow groundwater impacted) • Monitor groundwater for 5 years
• Building 99	**Common to Alternatives 2 and 3** • Suspected COCs: petroleum hydrocarbons, metals, VOCs • Perform additional characterization **Specific to Alternative 2a** • No source soil identified **Specific to Alternative 2b** • Excavate and dispose of source soil (est. 400 cy)

TABLE 9-3
SUMMARY OF KEY PARAMETERS FOR REMEDIAL ALTERNATIVES (a)
Oakland Army Base, Oakland, California

Location	Key Parameters
RMP Implementation Area	
• Washracks, Sumps, Oil/Water Separators, and Miscellaneous Operations	**Common to Alternatives 2a and 2b** • Primary COCs: petroleum hydrocarbons and related constituents • Perform additional characterization as needed **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Perform additional characterization • Remove existing structures, if present • Excavate and dispose of source soil as encountered at each location (est. 50 cy each)
• Tanks	**Common to Alternatives 2a, 2b, and 2c** • Primary COCs: petroleum hydrocarbons and related constituents **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Remove existing tanks, if present • Excavate and dispose of source soil as encountered at each location (est. 50 cy each) **Specific to Alternative 2c** • Remove existing tanks, if present • Excavate and dispose of source soil as encountered at each location (est. 50 cy each) • Continue ongoing groundwater monitoring at selected locations for 5 years
• Debris Area Near Building 99	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, VOCs, asbestos • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose of source soil as encountered (est. 200 cy)
• Building 85	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, VOCs • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose of source soil as encountered (est. 100 cy)
• Building 812	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, VOCs • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose of source soil as encountered (est. 100 cy)

TABLE 9-3
SUMMARY OF KEY PARAMETERS FOR REMEDIAL ALTERNATIVES (a)
Oakland Army Base, Oakland, California

Location	Key Parameters
RMP Implementation Area	
• Building 823	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, VOCs • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose of source soil as encountered (est. 200 cy)
• Potential Drum Drainage Area East of Buildings 805 and 806	**Common to Alternatives 2a and 2b** • Suspected COCs: metals, VOCs, pesticides • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose of impacted soil as encountered (est. 250 cy) • Perform in-situ treatment of groundwater (est. 6,300 sf area of shallow impacted groundwater) • Monitor groundwater for 5 years
• Former Motor Pool and Salvage Building 640	**Common to Alternatives 2 and 3** • Suspected COCs: petroleum hydrocarbons, metals, VOCs • Perform additional characterization **Specific to Alternative 2** • No impacted soil or groundwater discovered **Specific to Alternative 3** • Excavate and dispose of source soil as encountered (est. 250 cy) • Perform in-situ treatment of groundwater (est. 8,000 sf area of shallow impacted groundwater) • Monitor groundwater for 5 years
• Benzidine at Former Used Oil Tank 21	**Common to Alternatives 2a and 2b** • Suspected COCs: Petroleum hydrocarbons, metals, VOCs • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose impacted soil as encountered (est. 50 cy)
• Historical Spills and Stains	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, VOCs • Estimated stained area is 100,000 sf • Perform additional characterization **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Excavate and dispose of source soil as encountered (est. 1,900 cy)

TABLE 9-3
SUMMARY OF KEY PARAMETERS FOR REMEDIAL ALTERNATIVES (a)
Oakland Army Base, Oakland, California

Location	Key Parameters
RMP Implementation Area	
• Lead in Soil Around Buildings	**Common to Alternatives 2a and 2b** • Suspected COCs: lead • Perform additional characterization **Specific to Alternative 2a** • No impacted shallow soil discovered **Specific to Alternative 2b** • Excavate and dispose of impacted shallow soil as encountered (est. 1,500 cy)
• Former PCB-Containing Transformers and Equipment Locations	**Alternative 2** • Suspected COCs: PCBs • Perform additional characterization • Inventory and track equipment potentially containing PCBs (est. 110 pieces of equipment) • Dispose of PCB-containing oil (est. 2,500 gal) • Dispose of PCB-containing equipment (est. 44 tons)
• Storm Drains and Sanitary Sewers Locations	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, pesticides, PCBs • Perform additional characterization of sediments inside storm drains • Flush storm drain lines (est. 35,000 lf) **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Collect soil samples adjacent to storm drain lines in areas of encountered breakages or contaminant release • Excavate and dispose impacted soil as encountered (est. 22,500 cy)
• Railroad Tracks	**Common to Alternatives 2a and 2b** • Suspected COCs: petroleum hydrocarbons, metals, pesticides, PCBs, VOCs, PAHs • Investigate railroad track areas (est. 26 miles) • Manage railroad ties (est. 99,000 ties that weigh a total of 7,500 tons) **Specific to Alternative 2a** • No impacted soil or groundwater discovered **Specific to Alternative 2b** • Reuse all ballast on-site at no incremental environmental cost • Excavate and dispose subballast as RCRA or non-RCRA hazardous waste as encountered (est. 2,000 cy which is equivalent to 1% of total subballast volume) • Import gravel to maintain site cover (est. 13,000 cy) • Salvage 50% of railroad ties at no cost • Dispose of 50% of railroad ties as special waste (est. 3,800 tons)
• Marine Sediments at Former Parcels 2 and 3	**Alternative 2** • Suspected COCs: metals, pesticides, PCBs, PAHs • No remedial action required to implement Port of Oakland's Berth 21 Project • Marine sediments at Outfall 4 are designated as part of former Parcel 1

TABLE 9-3
SUMMARY OF KEY PARAMETERS FOR REMEDIAL ALTERNATIVES (a)
Oakland Army Base, Oakland, California

Notes:

(a) Abbreviations used in this table are as follows:

COC	chemical of concern
cy	cubic yard
est.	estimated
gal	gallons
lf	linear feet
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzodioxin
PCDF	polychlorinated dibenzofuran
RCRA	Resource Conservation and Recovery Act
sf	square foot or square feet
TCE	trichloroethene
VOC	volatile organic compound

TABLE 10-1
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
NO ACTION FOR SOIL AND GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if no chemicals of concern ("COCs") are present above screening levels for unrestricted use. No institutional controls are included in this alternative.
	• Compliance with ARARs	ARARs require institutional controls to meet unrestricted land use. No institutional controls are included.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative may offer long-term protection against exposure of humans and ecological receptors if no COCs are present above screening levels for unrestricted use.
	• Reduction of Toxicity, Mobility, Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of COCs.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be readily implemented.
	• Cost	Alternative has negligible costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is not anticipated to accept alternative at any site without institutional controls.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are not anticipated to accept alternative at any site without institutional controls.
• State of California Health and Safety Code Criteria		Alternative does not comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative is not selected at any sites.** **The no action alternative is included to comply with NCP requirements** and to provide a baseline for evaluating other remedial alternatives.

TABLE 10-2
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
INSTITUTIONAL CONTROLS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment, when used in combination with other alternatives, by restricting land use, groundwater use, or requiring implementation of the Risk Management Plan.
	• Compliance with ARARs	Alternative expected to comply with ARARs, when used in combination with other alternatives, by restricting land use, groundwater use, or requiring implementation of the Risk Management Plan.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative may offer long-term protection against exposure of humans if implemented and periodically verified, e.g., in accordance with the RMP protocols.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of COCs, although these actions may not be required if COC concentrations are less that applicable site-specific remedial goals.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be readily implemented.
	• Cost	Alternative has low costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control may accept alternative if it is protective of human health and the environment and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large may accept alternative if it is protective of human health and the environment and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative may comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative will be included** with selected remedial alternatives for RAP sites or RMP locations.

TABLE 10-3
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
MONITORED NATURAL ATTENUATION
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") are present above applicable site-specific remedial goals, and the soil is not expected to be an ongoing source of groundwater contamination.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where COC concentrations do not pose unacceptable risks to human health and the environment.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative may offer long-term protection against exposure of humans if COCs are ammenable to attenuation mechanisms.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative may reduce toxicity, mobility, or volume of COCs over time.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative is readily implemented for certain COCs.
	• Cost	Alternative has low costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control may accept alternative if it is protective of human health and the environment and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large may accept alternative if it is protective of human health and the environment and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative may comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected** for RAP sites or RMP locations where COC concentrations in groundwater are greater than applicable remedial goals and natural processes are likely to degrade or attenuate the COCs over time.

TABLE 10-4
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
PERFORM IN-SITU CHEMICAL OXIDATION/REDUCTION OF CHEMICALS OF CONCERN IN GROUNDWATER, AND MONITOR GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in groundwater can be effectively treated by in-situ chemical oxidation/reduction to bring concentrations of COCs below applicable site-specific remedial goals.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where COC concentrations are treated to be less than applicable remedial goals.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because the COCs are oxidized or reduced, and no longer present in the subsurface.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will reduce toxicity, mobility, and volume of COCs by in-situ treatment.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be readily implemented with standard chemical injection technologies.
	• Cost	Alternative has low to moderate capital and annual costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected** for RAP sites or RMP locations where COC concentrations in groundwater are greater than applicable remedial goals, and in-situ chemical oxidation/reduction is an effective means of treating the COCs. Groundwater monitoring is included to confirm effectiveness of treatment.

TABLE 10-5
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
PERFORM IN-SITU BIOREMEDIATION OF CHEMICALS OF CONCERN
IN GROUNDWATER, AND MONITOR GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in groundwater can be effectively treated by in-situ bioremediation to bring concentrations of COCs below applicable site-specific remedial goals.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where COC concentrations are treated to be less than applicable remedial goals.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because the COCs are biologically degraded, and no longer present in the subsurface.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will reduce toxicity, mobility, and volume of COCs by in-situ treatment.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be readily implemented with standard chemical injection technologies.
	• Cost	Alternative has low to moderate capital and annual costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected** for RAP sites or RMP locations where COC concentrations in groundwater are greater than applicable remedial goals, and in-situ bioremediation is an effective means of treating the COCs. Groundwater monitoring is included to confirm effectiveness of treatment.

TABLE 10-6
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
INSTALL VAPOR BARRIER BENEATH NEW BUILDING AND MONITOR GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in groundwater are volatile and can be effectively isolated from human inhalation pathways by vapor barriers beneath buildings.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where volatile COC concentrations could migrate into buildings and exceed inhalation exposure criteria for commercial/industrial workers.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because vapor barrier is an integral part of the building.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, and volume of COCs by treatment, though it will reduce mobility into buildings.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be implemented during building construction.
	• Cost	Alternative has low to moderate capital and annual costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected** for RAP sites or RMP locations where COC concentrations in groundwater are greater than applicable remedial goals, and positioning a vapor barrier beneath a building can reduce the potential for the migration of vapors into the building. Groundwater monitoring is included to monitor COC concentrations in groundwater.

TABLE 10-7
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
INSTALL VAPOR BARRIER WITH SUB-SLAB DEPRESSURIZATION SYSTEM
BENEATH NEW BUILDING AND MONITOR GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in groundwater are volatile and can be effectively isolated from human inhalation pathways by vapor barriers and a sub-slab depressurization system ("SSD") beneath buildings.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where volatile COC concentrations could migrate into buildings and exceed inhalation exposure criteria for commercial/industrial workers.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because vapor barrier with SSD is an integral part of the building.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, and volume of COCs by treatment, though it will increase mobility of volatiles out of the soil gas into the atmosphere (no off-gas treatment is assumed).
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be implemented during building construction.
	• Cost	Alternative has moderate capital and annual costs associated with implementation.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected** for RAP sites or RMP locations where COC concentrations in groundwater are greater than applicable remedial goals, and likely positioning a vapor barrier with an SSD system beneath a building can reduce the potential for the migration of vapors into the building. Groundwater monitoring is included to monitor COC concentrations in groundwater.

TABLE 10-8
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
EXCAVATE AND DISPOSE SOIL OFF-SITE, AND MONITOR GROUNDWATER AS NEEDED
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in soil exceed site-specific remedial goals, and groundwater impacts may or may not be present.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where soil with COC concentrations above remedial goals has been identified, and no groundwater remedial action is required.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because impacted soil is removed from the site.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community, other than minor soil removal activities.
	• Implementability	Alternative is readily implemented with standard excavation procedures.
	• Cost	Alternative has low to high capital cost, depending on the volume of soil to be managed, and low annual costs.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected** for RAP sites or RMP locations where COC concentrations in soil are identified to be greater than applicable remedial goals, and excavation and disposal of soil efficiently removes the COCs. Groundwater monitoring may be included if COCs have impacted groundwater.

TABLE 10-9
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
EXCAVATE AND DISPOSE SOIL OFF-SITE, IN-SITU
GROUNDWATER TREATMENT, AND MONITOR GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in soil and groundwater exceed site-specific remedial goals, impacted soils can be removed, and groundwater treatment technologies effectively treat residual COCs.
	• Compliance with ARARs	Alternative expected to comply with ARARs at sites where soil with COC concentrations above remedial goals has been identified in soil and groundwater, and groundwater remedial action is required.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because impacted soil is removed from the site and residual COCs in groundwater are treated in-situ..
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will reduce toxicity, mobility, and volume of COCs in the subsurface by a combination of removal and in-situ treatment of groundwater.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community, other than minor soil removal activities.
	• Implementability	Alternative is readily implemented with standard excavation procedures, and chemical injection procedures.
	• Cost	Alternative has moderate to high capital cost, and low to moderate annual costs.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
• State of California Health and Safety Code Criteria		Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria		**Alternative may be selected for RAP sites or RMP locations where** COC concentrations in soil and groundwater are elevated and concentrated in an identifiable area, such that excavation removes a significant volume of COCs. In-situ treatment addresses residual concentrations in groundwater. Groundwater monitoring is included.

TABLE 10-10
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVE:
EXCAVATE, CONDUCT EX-SITU IMMOBILIZATION,
AND DISPOSE SOIL OFF-SITE, AND MONITOR GROUNDWATER
Oakland Army Base, Oakland, California

	Evaluation Criteria	Conditions Under Which Alternative May Be Applicable
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative may be protective of human health and the environment if chemicals of concern ("COCs") in soil and groundwater exceed site-specific remedial goals, and soils must be treated prior to off-site disposal.
	• Compliance with ARARs	Alternative expected to comply with ARARs at Former ORP where soil with COC concentrations above remedial goals is anticipated to require treatment to meet disposal regulations.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative offers long-term effectiveness and permanence because impacted soil is removed from the site.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will reduce toxicity and mobility of COCs in soil by treatment, and will also decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community, other than soil removal activities.
	• Implementability	Alternative can be implemented with standard excavation procedures, and immobilization is a function of the characteristics of the waste.
	• Cost	Alternative has high capital cost, and low annual costs.
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control is anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• Community Acceptance	Community members of the Restoration Advisory Board and the community at large are anticipated to accept alternative as it is protective of human health and complies with ARARs.
	• State of California Health and Safety Code Criteria	Alternative is anticipated to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative may be selected** for the Former ORP Area only, where COC concentrations soil are elevated and may require immobilization for disposal of some oily residue waste to minimize free liquids or pH extremes. Groundwater monitoring is included.

TABLE 10-11
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate, Immobilize Soil, and Dispose of Soil Off-Site and Monitor Groundwater	
			2a. Reuse Some Overburden On-site	2b. Disposal All Soil Off-Site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs, provided a Land Disposal Restrictions ("LDRs") variance is received from regulatory agencies if waste is subject to LDRs.	Alternative is anticipated to comply with ARARs, provided a LDRs variance is received from regulatory agencies if waste is subject to LDRs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans receptors to chemicals of concern ("COCs") in soil or groundwater.	Alternative is anticipated to offer long-term effectiveness as impacted soil will be removed. Groundwater monitoring will verify long-term effectiveness.	Alternative is anticipated to offer long-term effectiveness as impacted soil will be removed. Groundwater monitoring will verify long-term effectiveness.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of soil or waste.	Alternative may reduce toxicity of COCs in soil by treatment, but will increase volume of waste by the addition of chemicals. Alternative will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.	Alternative will reduce toxicity of COCs in soil by stabilization, but will increase volume of waste by the addition of chemicals. Alternative will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.

TABLE 10-11
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate, Immobilize Soil, and Dispose of Soil Off-Site and Monitor Groundwater	
			2a. Reuse Some Overburden On-site	2b. Disposal All Soil Off-Site
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative involves excavation and treatment of impacted soil. Normal construction health and safety practices and OSHA standards would be employed to protect remedial construction workers and the general public. Dust, vapor, and odor control would also be implemented to protect the public.	Alternative involves excavation and treatment of impacted soil. Normal construction health and safety practices and OSHA standards would be employed to protect remedial construction workers and the general public. Dust, vapor, and odor control would also be implemented to protect the public.
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative requires a LDR variance; segregation and testing of overburden may be difficult to implement.	Alternative requires a LDR variance, but earthwork is easily implemented.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	 $6,400,000 $39,000 $6,600,000	 $7,600,000 $39,000 $7,800,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and the environment, and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and the environment, and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") or the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.

TABLE 10-11
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
FORMER ORP / BUILDING 1 AREA
Oakland Army Base, Oakland, California

Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate, Immobilize Soil, and Dispose of Soil Off-Site and Monitor Groundwater	
		2a. Reuse Some Overburden On-site	2b. Disposal All Soil Off-Site
• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria	**Alternative is Not Selected.** COC concentrations in soil are greater than applicable site-specific remedial goals and pose unacceptable risks to human health and the environment. Alternative does not meet ARARs for unrestricted use.	**Alternative is Not Selected.** Soil and waste with COC concentrations greater than applicable site-specific remedial goals will be removed. However, stockpile and reuse of existing site soils is not anticipated to be feasible due to potential chemical impacts, difficulties segregating soil during excavation activities, and geotechnical requirements for backfill.	**Selected Alternative.** Soil and waste with COC concentrations greater than applicable site-specific remedial goals will be removed, treated, and disposed off-site in a permitted facility. Groundwater monitoring will be implemented to verify remedial action effectiveness.

TABLE 10-12
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
VOCs IN GROUNDWATER AT THE EASTERN END OF BUILDING 807
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Chemical Oxidation/ Reduction and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative may comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil or groundwater.	Alternative does not offer long-term effectiveness as chemical concentrations may continue to remain elevated or increase over time. Alternative assumes 15 years of groundwater monitoring.	Alternative is anticipated to offer long-term effectiveness as COCs will be chemically oxidized in the subsurface. Five years of groundwater monitoring will verify long-term effectiveness.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted groundwater.	Alternative will not reduce toxicity, mobility, or volume of impacted groundwater.	Alternative will likely reduce toxicity, mobility, and volume of impacted groundwater through treatment.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community.

TABLE 10-12
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
VOCs IN GROUNDWATER AT THE EASTERN END OF BUILDING 807
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Chemical Oxidation/ Reduction and Monitor Groundwater
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative can be implemented, as it involves standard well installation and monitoring procedures.	Alternative can be implemented, as it involves standard well installation and chemical injection procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$82,000 $46,000 $620,000	$220,000 $46,000 $430,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC may accept remedial action because alternative is protective of human health and the environment, may comply with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and the environment, and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative may comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** COC concentrations in groundwater are greater than screening levels for unrestricted use; no institutional controls are included in this alternative.	**Alternative is Not Selected.** Ongoing monitoring for groundwater with elevated concentrations of COCs that may continue to rise does not provide a long-term solution.	**Selected Alternative.** Elevated COCs in groundwater will be treated. Groundwater monitoring will demonstrate effectiveness.

TABLE 10-13

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDINGS 808 AND 823

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Biodegradation and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health or the environment.	Alternative may be protective of human health and environment.	Alternative is anticipated to be protective of human health and environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is expected to comply with ARARs.	Alternative is expected to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans and ecological receptors to chemicals of concern ("COCs") in groundwater.	Alternative does not offer long-term effectiveness as chemical concentrations may continue to remain elevated or increase over time. Alternative assumes 15 years of groundwater monitoring.	Alternative is anticipated to offer long-term effectiveness as COCs will be biologically degraded in the subsurface. Five years of groundwater monitoring will verify long-term effectiveness.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of COCs.	Alternative will not reduce toxicity, mobility, or volume of COCs.	Alternative could reduce toxicity, mobility, and volume of COCs by treatment that degrades COCs in groundwater.

TABLE 10-13

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDINGS 808 AND 823

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 4 Install Vapor Barrier Beneath Building and Monitor Groundwater	Alternative 5 Install Vapor Barrier with Sub-slab Depressurization System, Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is anticipated to be protective of human health and environment.	Alternative is anticipated to be protective of human health and environment.
	• Compliance with ARARs	Alternative is expected to comply with ARARs.	Alternative is expected to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Long-term effectiveness is a function of the effectiveness of the barrier beneath the building. Impacted groundwater remains in the subsurface and could potentially migrate. Fifteen years of groundwater monitoring will verify long-term effectiveness.	Long-term effectiveness is a function of the effectiveness of the barrier beneath the building and the ability of the depressurization system to limit migration into buildings. Impacted groundwater remains in the subsurface and could potentially migrate. Fifteen years of groundwater monitoring will verify long-term effectiveness.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity or volume of COCs in groundwater, but it may decrease mobility by volatilization pathways by providing subsurface containment.	Alternative will not reduce toxicity or volume of COCs in groundwater. Mobility of COCs is increased by transferring COCs from groundwater to air. Exhaust air treatment system is not anticipated to be required.

TABLE 10-13

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDINGS 808 AND 823

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Biodegradation and Monitor Groundwater
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community.
Balancing Criteria	• Implementability	Alternative can be easily implemented.	Alternative can be implemented, as it involves standard groundwater monitoring procedures.	Alternative can be implemented, as it involves standard chemical injection procedures and monitoring.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$83,000 $39,000 $540,000	$340,000 $39,000 $520,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC may not accept remedial action if exposure to volatile COCs could potentially occur in future land use scenarios.	It is expected that DTSC will consider this alternative to be acceptable.
Modifying Criteria	• Community Acceptance	Alternative is not anticipated to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	RAB and community may not accept remedial action if exposure to volatile COCs could potentially occur in future land use scenarios.	Alternative is likely to be an acceptable alternative to the RAB and community.

TABLE 10-13

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDINGS 808 AND 823

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 4 Install Vapor Barrier Beneath Building and Monitor Groundwater	Alternative 5 Install Vapor Barrier with Sub-slab Depressurization System, Monitor Groundwater
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community. Vapor barrier would be installed during building construction.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community. Sub-slab depressurization system would be installed during building construction.
	• Implementability	This alternative can be easily implemented during building construction. Implementation post construction is difficult.	This alternative can be easily implemented during building construction. Implementation post construction is difficult.
	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	 $240,000 $39,000 $700,000	 $540,000 $56,000 $1,200,000
Modifying Criteria	• State Acceptance	It is expected that DTSC will consider this alternative to be acceptable.	It is expected that DTSC will consider this alternative to be acceptable.
	• Community Acceptance	Alternative is likely to be an acceptable alternative to the RAB and community.	Alternative is likely to be an acceptable alternative to the RAB and community.

TABLE 10-13

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDINGS 808 AND 823

Oakland Army Base, Oakland, California

Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Biodegradation and Monitor Groundwater
• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** Alternative does not limit potential exposure to volatile COCs in potential future land use.	**Selected Alternative.** COCs in groundwater are actively remediated. Groundwater treatment could effectively reduce potential human health impacts. Remedial action is anticipated to be complete in 5 years.

TABLE 10-13

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDINGS 808 AND 823

Oakland Army Base, Oakland, California

Evaluation Criteria	Alternative 4 Install Vapor Barrier Beneath Building and Monitor Groundwater	Alternative 5 Install Vapor Barrier with Sub-slab Depressurization System, Monitor Groundwater
• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria	**Alternative is Not Selected.** Although alternative is likely to be protective of human health and the environment and may be acceptable to DTSC and the community, it is not the most cost-effective alternative. The COCs remain in place, and ongoing monitoring to verify protection of human health is estimated to extend 15 years.	**Alternative is Not Selected.** Although alternative is likely to be protective of human health and the environment and may be acceptable to DTSC and the community, it is not the most cost-effective alternative. The COCs remain in place, and ongoing monitoring to verify protection of human health is estimated to extend 15 years.

TABLE 10-14

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDING 99

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Biodegradation and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health or the environment.	Alternative may be protective of human health and environment.	Alternative is anticipated to be protective of human health and environment.
	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is expected to comply with ARARs.	Alternative is expected to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans and ecological receptors to chemicals of concern ("COCs") in groundwater.	Alternative does not offer long-term effectiveness as chemical concentrations may continue to remain elevated or increase over time. Alternative assumes 15 years of groundwater monitoring.	Alternative is anticipated to offer long-term effectiveness as COCs will be biologically degraded in the subsurface. Five years of groundwater monitoring will verify long-term effectiveness.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of COCs.	Alternative will not reduce toxicity, mobility, or volume of COCs.	Alternative could reduce toxicity, mobility, and volume of COCs by treatment that degrades COCs in groundwater.

TABLE 10-14

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDING 99

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 4 Install Vapor Barrier Beneath Building and Monitor Groundwater	Alternative 5 Install Vapor Barrier with Sub-slab Depressurization System, Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is anticipated to be protective of human health and environment.	Alternative is anticipated to be protective of human health and environment.
	• Compliance with ARARs	Alternative is expected to comply with ARARs.	Alternative is expected to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Long-term effectiveness is a function of the effectiveness of the barrier beneath the building. Impacted groundwater remains in the subsurface and could potentially migrate. Fifteen years of groundwater monitoring will verify long-term effectiveness.	Long-term effectiveness is a function of the effectiveness of the barrier beneath the building and the ability of the depressurization system to limit migration into buildings. Impacted groundwater remains in the subsurface and could potentially migrate. Fifteen years of groundwater monitoring will verify long-term effectiveness.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity or volume of COCs in groundwater, but it may decrease mobility by volatilization pathways by providing subsurface containment.	Alternative will not reduce toxicity or volume of COCs in groundwater. Mobility of COCs is increased by transferring COCs from groundwater to air. Exhaust air treatment system is not anticipated to be required.

TABLE 10-14

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDING 99

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Biodegradation and Monitor Groundwater
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community.
	• Implementability	Alternative can be easily implemented.	Alternative can be implemented, as it involves standard groundwater monitoring procedures.	Alternative can be implemented, as it involves standard chemical injection procedures and monitoring.
	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$82,000 $39,000 $540,000	$320,000 $39,000 $500,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC may not accept remedial action if exposure to volatile COCs could potentially occur in future land use scenarios.	It is expected that DTSC will consider this alternative to be acceptable.
	• Community Acceptance	Alternative is not anticipated to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	RAB and community may not accept remedial action if exposure to volatile COCs could potentially occur in future land use scenarios.	Alternative is likely to be an acceptable alternative to the RAB and community.

TABLE 10-14

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDING 99

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 4 Install Vapor Barrier Beneath Building and Monitor Groundwater	Alternative 5 Install Vapor Barrier with Sub-slab Depressurization System, Monitor Groundwater
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community. Vapor barrier would be installed during building construction.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community. Sub-slab depressurization system would be installed during building construction.
	• Implementability	This alternative can be easily implemented during building construction. Implementation post construction is difficult.	This alternative can be easily implemented during building construction. Implementation post construction is difficult.
	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	 $230,000 $39,000 $690,000	 $480,000 $43,000 $1,000,000
Modifying Criteria	• State Acceptance	It is expected that DTSC will consider this alternative to be acceptable.	It is expected that DTSC will consider this alternative to be acceptable.
	• Community Acceptance	Alternative is likely to be an acceptable alternative to the RAB and community.	Alternative is likely to be an acceptable alternative to the RAB and community.

TABLE 10-14

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDING 99

Oakland Army Base, Oakland, California

Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Monitor Groundwater	Alternative 3 Perform In-situ Biodegradation and Monitor Groundwater
• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** Alternative does not limit potential exposure to volatile COCs in potential future land use.	**Selected Alternative.** COCs in groundwater are actively remediated. Groundwater treatment could effectively reduce potential human health impacts. Remedial action is anticipated to be complete in 5 years.

TABLE 10-14

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

VOCs IN GROUNDWATER NEAR BUILDING 99

Oakland Army Base, Oakland, California

Evaluation Criteria	Alternative 4 Install Vapor Barrier Beneath Building and Monitor Groundwater	Alternative 5 Install Vapor Barrier with Sub-slab Depressurization System, Monitor Groundwater
• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
• Summary of Evaluation Criteria	**Alternative is Not Selected.** Although alternative is likely to be protective of human health and the environment and is acceptable to DTSC and the community, it is not the most cost-effective alternative. The COCs remain in place, and ongoing monitoring to verify protection of human health is estimated to extend 15 years.	**Alternative is Not Selected.** Although alternative is likely to be protective of human health and the environment and is acceptable to DTSC and the community, it is not the most cost-effective alternative. The COCs remain in place, and ongoing monitoring to verify protection of human health is estimated to extend 15 years.

TABLE 10-15
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BENZENE AND MTBE IN GROUNDWATER NEAR FORMER USTs 11A/12A/13A
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater	Alternative 3 Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment, and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil or groundwater.	Alternative offers long-term effectiveness as soil with elevated concentrations of COCs will be disposed off-site. Alternative assumes 5 years of groundwater monitoring.	Alternative offers long-term effectiveness as soil with elevated concentrations of COCs will be removed, and residual COCs will be biologically degraded. subsurface. Alternative assumes 5 years of groundwater monitoring.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil or groundwater.	Alternative will not reduce toxicity of COCs in subsurface, but will reduce volume and mobility by removal to off-site permitted disposal facility.	Alternative will likely reduce toxicity, mobility, and volume of impacted soil and groundwater through removal and in-situ treatment.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-15
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BENZENE AND MTBE IN GROUNDWATER NEAR FORMER USTs 11A/12A/13A
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater	Alternative 3 Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment, and Monitor Groundwater
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative can be implemented, as it involves standard soil excavation procedures.	Alternative can be implemented, as it involves standard soil excavation and chemical injection procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$220,000 $42,000 $410,000	$270,000 $42,000 $460,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** Although excavation will remove COCs i removed, COCs would likely remain in groundwater.	**Selected Alternative.** COCs in soil and groundwater greater than applicable site-specific remedial goals will be removed or treated.

TABLE 10-16
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 991 AREA
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater	Alternative 3 Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment, and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil or groundwater.	Alternative offers long-term effectiveness as soil with elevated concentrations of COCs will be disposed off-site. Alternative assumes 5 years of groundwater monitoring.	Alternative offers long-term effectiveness as soil with elevated concentrations of COCs will be removed, and residual COCs will be biologically degraded. subsurface. Alternative assumes 5 years of groundwater monitoring.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil or groundwater.	Alternative will not reduce toxicity of COCs in subsurface, but will reduce volume and mobility by removal to off-site permitted disposal facility.	Alternative will likely reduce toxicity, mobility, and volume of impacted soil and groundwater through removal and in-situ treatment.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-16
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 991 AREA
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater	Alternative 3 Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment, and Monitor Groundwater
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative can be implemented, as it involves standard soil excavation procedures.	Alternative can be implemented, as it involves standard soil excavation and chemical injection procedures.
	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$270,000 $38,000 $440,000	$470,000 $47,000 $680,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** Although excavation will remove COCs i removed, COCs would likely remain in groundwater.	**Selected Alternative.** COCs in soil and groundwater greater than applicable site-specific remedial goals will be removed or treated.

TABLE 10-17
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 99
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site. Removal also reduces potential for future groundwater impact.
	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-17
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 99
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative can be implemented, as it involves standard soil excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$70,000 $0 $70,000	$230,000 $0 $230,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-18
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative may not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil, if present.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site. Removal also reduces potential for future groundwater impact.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil, if present.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-18
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
WASHRACKS, SUMPS, OIL/WATER SEPARATORS, AND MISCELLANEOUS OPERATIONS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost (a) Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$890,000 $0 $890,000	$2,300,000 $0 $2,300,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

Notes:

(a) Costs listed are cumulative expenditures to address approximately 82 washracks, sumps, oil/water separators, and miscellaneous items at approximately 55 locations on the OARB.

TABLE 10-19
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
TANKS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed		
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Soil Off-site	2c. Excavate and Dispose Soil Off-site, and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site. Removal also reduces potential for future groundwater impact.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site. Removal also reduces potential for future groundwater impact. Alternative assumes 5 years of groundwater monitoring for some sites.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil, if present.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-19
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
TANKS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed		
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Soil Off-site	2c. Excavate and Dispose Soil Off-site, and Monitor Groundwater
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative can be implemented, as it involves standard soil excavation procedures.	Alternative can be implemented, as it involves standard soil excavation procedures.
Balancing Criteria	• Cost (a) Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$740,000 $0 $740,000	$1,580,000 $0 $1,600,000	$1,620,000 $115,000 $2,100,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate at some locations.	**Alternative is Not Selected.** COCs identified above site-specific remedial goals soil would be removed. Groundwater monitoring is anticipated to be required at some sites.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed. Groundwater monitoring will be conducted at some sites to verify remedial objectives attained.

Notes:

(a) Costs listed are cumulative expenditures to address approximately 93 underground storage tanks and aboveground storage tanks at approximately 73 locations on the OARB.

TABLE 10-20
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
DEBRIS AREA NEAR BUILDING 99
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-20
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
DEBRIS AREA NEAR BUILDING 99
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$56,000 $0 $56,000	$170,000 $0 $170,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-21
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 85
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-21
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 85
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$56,000 $0 $56,000	$140,000 $0 $140,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-22
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 812
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-22
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 812
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$60,000 $0 $60,000	$150,000 $0 $150,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-23
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 823
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-23
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BUILDING 823
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$60,000 $0 $60,000	$170,000 $0 $170,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-24
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
POTENTIAL DRUM DRAINAGE AREA EAST OF BUILDINGS 805 AND 806
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, In-Situ Groundwater Treatment, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site, Groundwater Treatment
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil or groundwater.	Alternative offers long-term effectiveness as no impacted soil is identified.	Alternative offers long-term effectiveness as soil with elevated concentrations of COCs will be removed, and residual COCs will be treated in-situ. Alternative assumes 5 years of groundwater monitoring.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will likely reduce toxicity, mobility, and volume of impacted soil and groundwater through removal and in-situ treatment.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-24
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
POTENTIAL DRUM DRAINAGE AREA EAST OF BUILDINGS 805 AND 806
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, In-Situ Groundwater Treatment, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site, Groundwater Treatment
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative can be implemented, as it involves standard soil excavation and chemical injection procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$69,000 $0 $69,000	$300,000 $17,000 $380,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations above remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs in soil and groundwater greater than applicable site-specific remedial goals will be removed or treated.

TABLE 10-25
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
FORMER MOTOR POOL AND SALVAGE OPERATIONS AT BUILDING 640
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	Alternative 3 Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment, and Monitor Groundwater
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil or groundwater.	Alternative offers long-term effectiveness as impacted soil, if present, will be excavated and disposed off-site.	Alternative offers long-term effectiveness as soil with elevated concentrations of COCs will be removed, and residual COCs will be treated in-situ. Alternative assumes 5 years of groundwater monitoring.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.	Alternative will likely reduce toxicity, mobility, and volume of impacted soil and groundwater through removal and in-situ treatment.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-25
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
FORMER MOTOR POOL AND SALVAGE OPERATIONS AT BUILDING 640
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	Alternative 3 Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment, and Monitor Groundwater
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative can be implemented, as it involves standard soil excavation and chemical injection procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$170,000 $0 $170,000	$430,000 $16,000 $500,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** COCs identified above site-specific remedial goals soil would be removed. If no impacts are found, this alternative may be appropriate.	**Selected Alternative.** COCs in soil and groundwater greater than applicable site-specific remedial goals will be removed or treated.

TABLE 10-26
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BENZIDINE AT FORMER USED OIL TANK 21
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-26
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
BENZIDINE AT FORMER USED OIL TANK 21
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$40,000 $0 $40,000	$130,000 $0 $130,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-27
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
HISTORIC SPILLS AND STAINS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-27
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
HISTORIC SPILLS AND STAINS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$140,000 $0 $140,000	$560,000 $0 $560,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-28
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
LEAD IN SOIL AROUND BUILDINGS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to lead in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no lead greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of lead in soil, if present, but will decrease on-site volume and mobility of lead in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-28
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
LEAD IN SOIL AROUND BUILDINGS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$47,000 $0 $47,000	$460,000 $0 $460,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If lead is not detected at concentrations greater than site- specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** Lead identified above site-specific remedial goals soil would be removed.

TABLE 10-29

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

FORMER PCB-CONTAINING TRANSFORMERS AND EQUIPMENT LOCATIONS

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Equipment, Soil, or Groundwater	Alternative 2 Remove and Dispose of Waste Off-site, and Monitor Groundwater As Needed
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to polychlorinated biphenyls ("PCBs") in equipment, soil, or groundwater.	Alternative offers long-term effectiveness as PCB-containing equipment will be removed and properly disposed. No groundwater monitoring is anticipated.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of PCBs in equipment, soil, or groundwater.	Alternative will not reduce toxicity of PCBs in electrical components or soil, if present, but will decrease on-site volume and mobility of PCBs by removal and disposal at a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor equipment removal activities.

TABLE 10-29

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:

FORMER PCB-CONTAINING TRANSFORMERS AND EQUIPMENT LOCATIONS

Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Equipment, Soil, or Groundwater	Alternative 2 Remove and Dispose of Waste Off-site, and Monitor Groundwater As Needed
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative can be implemented, as it involves standard equipment replacement procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$260,000 $0 $260,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Selected Alternative.** PCBs identified in electrical equipment and other materials would be removed and disposed of at a permitted off-site disposal facility.

TABLE 10-30
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
STORM DRAINS AND SANITARY SEWERS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted soil will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative will have minor disruptions to the community as the flushing and inspection activities will likely be in public rights of way.	Alternative will have minor disruptions to the community as the flushing, inspection, investigation, and source removal activities will likely be in public rights of way.

TABLE 10-30
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
STORM DRAINS AND SANITARY SEWERS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative can be implemented using standard drain inspection procedures.	Alternative can be implemented, as it involves standard drain inspection and soil excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$990,000 $0 $990,000	$3,600,000 $0 $3,600,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no structural defects are identified in the pipes which could transport COCs in the subsurface, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-31
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
RAILROAD TRACKS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Threshold Criteria	• Overall Protection of Human Health and the Environment	Alternative is not anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.	Alternative is anticipated to be protective of human health and the environment.
Threshold Criteria	• Compliance with ARARs	Alternative is not anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.	Alternative is anticipated to comply with ARARs.
Balancing Criteria	• Long-term Effectiveness and Permanence	Alternative will not offer long-term protection against exposure of humans to chemicals of concern ("COCs") in soil.	Alternative may offer long-term effectiveness.	Alternative offers long-term effectiveness as impacted subballast will be excavated and disposed off-site.
Balancing Criteria	• Reduction of Toxicity, Mobility, or Volume through Treatment	Alternative will not reduce toxicity, mobility, or volume of impacted soil.	Alternative assumes no COCs greater than applicable remedial goals remain in the subsurface.	Alternative will not reduce toxicity of COCs in soil, if present, but will decrease on-site volume and mobility of COCs in soil by removal to a permitted off-site disposal facility.
Balancing Criteria	• Short-term Effectiveness	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in any short-term disruptions or risks to workers and the community.	Alternative is not anticipated to result in significant short-term disruptions or risks to workers and the community, other than minor soil excavation activities.

TABLE 10-31
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES:
RAILROAD TRACKS
Oakland Army Base, Oakland, California

	Evaluation Criteria	Alternative 1 No Action for Soil and Groundwater	Alternative 2 Excavate and Dispose Soil Off-site, and Monitor Groundwater As Needed	
			2a. No Impacted Soil or Groundwater Identified	2b. Excavate and Dispose Impacted Soil Off-site
Balancing Criteria	• Implementability	Alternative is easily implemented.	Alternative is easily implemented.	Alternative is easily implemented with standard excavation procedures.
Balancing Criteria	• Cost Estimated Capital Cost: Estimated Annual Cost: Estimated Present Worth:	Alternative has negligible costs associated with implementation.	$430,000 $0 $430,000	$1,700,000 $0 $1,700,000
Modifying Criteria	• State Acceptance	State of California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") is not anticipated to accept alternative.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.	DTSC is anticipated to accept remedial action because alternative is protective of human health and complies with ARARs.
Modifying Criteria	• Community Acceptance	Alternative is not likely to be accepted by community members of the Restoration Advisory Board ("RAB") and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.	Alternative is anticipated to be accepted by the RAB and the community at large.
	• Six Factors from State of California Health and Safety Code Section 25356.1	Alternative does not comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.	Alternative is believed to comply with State of California Health and Safety Code Criteria.
	• Summary of Evaluation Criteria	**Alternative is Not Selected.** Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Selected.** If no COCs are detected at concentrations greater than site-specific remedial goals, this alternative may be appropriate.	**Selected Alternative.** COCs identified above site-specific remedial goals soil would be removed.

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
RAP Sites							
● Former ORP/Building 1 Area							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Immobilize Tarry Residue, with Off-Site Disposal and Monitor Groundwater (c);(d)*							
2a *Reuse Overburden and Soil with TCP On-Site*	*5*	$6,400,000	$39,000	$6,600,000	--	--	--
2b *Dispose of Overburden and Soil with TCP Off-Site*	*5*	$7,600,000	$39,000	$7,800,000	**$7,600,000**	**$39,000**	**$7,800,000**
● VOCs in Groundwater at Eastern End of Building 807							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Monitor Groundwater*	*15*	$82,000	$46,000	$620,000	--	--	--
3 *Perform In-Situ Chemical Oxidation/Reduction and Monitor Groundwater*	*5*	$220,000	$46,000	$430,000	**$220,000**	**$46,000**	**$430,000**
● VOCs in Groundwater Near Buildings 808 and 823							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Monitor Groundwater*	*15*	$83,000	$39,000	$540,000	--	--	--
3 *Perform In-Situ Bioremediation and Monitor Groundwater*	*5*	$340,000	$39,000	$520,000	**$340,000**	**$39,000**	**$520,000**
4 *Install Vapor Barrier Beneath Building and Monitor Groundwater*	*15*	$240,000	$39,000	$700,000	--	--	--
5 *Install Vapor Barrier with Sub-Slab Depressurization System ("SSD") Beneath Building and Monitor Groundwater*	*15*	$540,000	$56,000	$1,200,000	--	--	--

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
RAP Sites (contd)							
● VOCs in Groundwater Near Building 99							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Monitor Groundwater*	*15*	$82,000	$39,000	$540,000	--	--	--
3 *Perform In-Situ Bioremediation and Monitor Groundwater*	*5*	$320,000	$39,000	$500,000	**$320,000**	**$39,000**	**$500,000**
4 *Install Vapor Barrier Beneath Building and Monitor Groundwater*	*15*	$230,000	$39,000	$690,000	--	--	--
5 *Install Vapor Barrier & SSD Beneath Building, Monitor Groundwater*	*15*	$480,000	$43,000	$1,000,000	--	--	--
● Benzene and MTBE in Groundwater Near Former USTs 11A/12A/13A							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*	*5*	$220,000	$42,000	$410,000	--	--	--
3 *Excavate and Dispose Soil Off-site, In-situ Groundwater Treatment and Monitor Groundwater*	*5*	$270,000	$42,000	$460,000	**$270,000**	**$42,000**	**$460,000**
● Building 991 Area							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*	*5*	$270,000	$38,000	$440,000	--	--	--
3 *Excavate and Dispose Soil Off-site, In-Situ Bioremediation, and Monitor Groundwater*	*5*	$470,000	$47,000	$680,000	**$470,000**	**$47,000**	**$680,000**
● Building 99							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$70,000	$0	$70,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$230,000	$0	$230,000	**$230,000**	**$0**	**$230,000**

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
RMP Implementation Area							
● Washracks, Sumps, Oil/Water Separators, and Miscellaneous Operations							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$890,000	$0	$890,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$2,300,000	$0	$2,300,000	**$2,300,000**	**$0**	**$2,300,000**
● Tanks							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$740,000	$0	$740,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$1,580,000	$0	$1,600,000	--	--	--
2c *Impacted Soil Excavated and Disposed Off-site, Monitor Groundwater*	*5*	$1,620,000	$115,000	$2,100,000	**$1,600,000**	**$120,000**	**$2,100,000**
● Debris Area Near Building 99							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$56,000	$0	$56,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$170,000	$0	$170,000	**$170,000**	**$0**	**$170,000**
● Building 85							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$56,000	$0	$56,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$140,000	$0	$140,000	**$140,000**	**$0**	**$140,000**

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
RMP Implementation Area (contd)							
● Building 812							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$60,000	$0	$60,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$150,000	$0	$150,000	**$150,000**	**$0**	**$150,000**
● Building 823							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$60,000	$0	$60,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$170,000	$0	$170,000	**$170,000**	**$0**	**$170,000**
● Potential Drum Drainage Area East of Buildings 805 and 806							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, In-Situ Groundwater Treatment, and Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$69,000	$0	$69,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site, In-Situ Groundwater Treatment, and Monitor Groundwater*	*5*	$300,000	$17,000	$380,000	**$300,000**	**$17,000**	**$380,000**
● Former Motor Pool and Salvage Operations at Building 640							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*	*0*	$170,000	$0	$170,000	--	--	--
3 *Excavate and Dispose Soil Off-site, In-Situ Groundwater Treatment, and Monitor Groundwater*	*5*	$430,000	$16,000	$500,000	**$430,000**	**$16,000**	**$500,000**

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
RMP Implementation Area (contd)							
● Benzidine at Former Used Oil Tank 21							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$40,000	$0	$40,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$130,000	$0	$130,000	**$130,000**	**$0**	**$130,000**
● Historical Spills and Stains							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$140,000	$0	$140,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$560,000	$0	$560,000	**$560,000**	**$0**	**$560,000**
● Lead in Soil Around Buildings							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$47,000	$0	$47,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$460,000	$0	$460,000	**$460,000**	**$0**	**$460,000**
● Former PCB-Containing Transformers and Equipment Locations							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*	*0*	$260,000	$0	$260,000	**$260,000**	**$0**	**$260,000**

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
RMP Implementation Area (contd)							
● Storm Drains and Sanitary Sewers							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$990,000	$0	$990,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$3,600,000	$0	$3,600,000	**$3,600,000**	**$0**	**$3,600,000**
● Railroad Tracks							
1 *No Action for Soil and Groundwater*	*0*	$0	$0	$0	--	--	--
2 *Excavate and Dispose Soil Off-site, Monitor Groundwater As Needed*							
2a *No Impacted Soil or Groundwater Identified*	*0*	$430,000	$0	$430,000	--	--	--
2b *Impacted Soil Excavated and Disposed Off-site*	*0*	$1,700,000	$0	$1,700,000	**$1,700,000**	**$0**	**$1,700,000**
● Marine Sediments at Former Parcels 2 and 3							
1 *No Action for Sediments*	*0*	$0	$0	$0	--	--	--
2 *No Further Action/Containment by Filling for Port's Berth 21 Project*	*10*	$0	$22,000	$190,000	**$0**	**$22,000**	**$190,000**

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Remedial Alternative	Assumed Project Duration (years)	Remedial Alternative Estimated Cost (2001 dollars)			Preferred Remedy Estimated Cost (2001 dollars)		
		Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs	Estimated Capital Costs	Estimated Annual Costs	Present Worth of Total Estimated Costs
Indirect Costs to Coordinate Implementation of Remedial Actions							
● Basewide Regulatory Agency Compliance							
1 *Best-case Scenario*	*5*	$410,000	$500,000	$2,700,000	--	--	--
2 *Expected Scenario*	*5*	$590,000	$710,000	$3,800,000	**$590,000**	**$710,000**	**$3,800,000**
● Operations and Maintenance/5 Year Reviews/Reporting							
1 *Best-case Scenario*	*30*	$0	$30,000	$570,000	--	--	--
2 *Expected Scenario*	*30*	$0	$43,000	$820,000	**$0**	**$43,000**	**$820,000**
● Implementation of Risk Management Plan							
1 *Best-case Scenario*	*30*	$0	$36,000	$690,000	--	--	--
2 *Expected Scenario*	*30*	$0	$51,000	$970,000	**$0**	**$51,000**	**$970,000**
				TOTAL (e)	**$22,000,000**	**$1,230,000**	**$29,000,000**

TABLE 10-32
SUMMARY OF COST ASSOCIATED WITH POTENTIAL REMEDIAL ACTIONS (a), (b)
Oakland Army Base, Oakland, California

Notes:

(a) Consistent with U.S. EPA *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study,* dated July 2000, present worth of total estimated costs have been calculated assuming a real discount rate of 3.2 percent. The real discount rate is assumed to be equivalent to the nominal interest rate on 30-year federal treasury notes and bonds upon adjustment to remove the effect of expected inflation. The real discount rate has been estimated following guidelines in Circular No. A-94 published by the Federal Office of Management and Budget, Appendix C, revised January 2001.

(b) Annual costs, if any, are a function of the specific alternative.

(c) For Building 1, Alternatives 2a and 2b assume that oily residue to be excavated and successfully neutralized and stabilized for metals at the site prior to acceptance at an off-site, permitted disposal facility. These alternatives also assume U.S. EPA and DTSC grant a variance from Land Disposal Restrictions for Underlying Hazardous Constituents above their respective Universal Treatment Standards, if required by waste characteristics. These alternatives also assume an off-site, permitted disposal facility will accept the waste with the regulatory variance. In addition, Alternatives 2a and 2b assume demolition of Building 1 is funded and conducted by the Army prior to property transfer. No Building 1 demolition costs are included in this estimate.

(d) Alternative 2a assumes that overburden and some soil can be reused to fill the excavation at the site. Alternative 2b assumes that all overburden and some soil must be disposed as non-hazardous waste. Odor control is assumed to be required for Alternative 2b as well.

(e) Total does not include (a) reimbursement of regulatory agency oversight fees, and (b) environmental insurance premiums.