PART II

3.0 NEWIOU Remedial Investigation Summary

The primary objectives of the NOU, EIOU, and WIOU RIs were to evaluate the nature and extent of contamination in the NEWIOU and to assess the potential risks to human health and the environment posed by the contamination. Following the RI field activities and data evaluation, each site received an HHRA and ERA. A quantitative HHRA resulted in the identification of COCs for each site and the calculation of site-related excess lifetime cancer risks, as well as hazard indices (HIs) (for non-cancer-causing chemicals) for each COC. Similarly, the ERA resulted in the identification of contaminants of potential ecological concern (COPECs) for each site and the calculation of hazard quotients (HQs) for various ecological receptors (selected indicator species of plants and animals) for each COPEC.

3.1 Nature and Extent of Contamination

In the RIs for the NEWIOU, soil contamination was identified for possible remediation at 18 sites. At 2 of these sites, sediment and surface water contamination also was identified for possible remediation. (Sediment comprises the layer of soil, sand, and minerals that has been deposited by water or wind within permanent water bodies, such as Union Creek, and those within seasonal surface water bodies, such as vernal pools, wetlands, oxidation ponds, and drainage ditches.) The 18 sites included areas that were used for fire training, aircraft maintenance, painting, aircraft washdowns, landfills, and jet fuel distribution. Table II-3-1 provides a brief description of each site. More detailed descriptions are provided in Section 3.3. Figure II-3-1 shows the location of the NEWIOU soil, sediment, and surface water sites and estimated areas of soil contamination identified in the RIs and further evaluated in the NEWIOU FS. Figures in Section 5.0 show contamination in more detail at each site recommended for excavation.

The results of the NOU RI indicated that contaminants from Landfills 1 and 2 have reached the groundwater. The groundwater beneath the landfills is contaminated with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and dioxins. These constituents also were detected in samples of surface and subsurface soils. Although COCs are present throughout the NOU, the higher COC concentrations are generally located in the central portions of Landfill 2 (LF007).

In the WIOU RI, two primary contaminant types were identified: total petroleum hydrocarbons (TPH) and related compounds, primarily benzene, and chlorinated solvents, primarily trichloroethene (TCE). These contaminants were detected in soil, soil gas, surface water, sediment, and groundwater samples at various locations within the WIOU. TPH and TCE were commingled within the plumes for individual sites, and the plumes from each site had commingled with each other to the point that the groundwater contamination in the WIOU is being treated as one large plume and remediated under CERCLA.

In the EIOU RI, the contaminants detected in soil and groundwater were primarily VOCs, including TCE. Certain metals, dioxin, and PCBs also were detected in samples of sediment, soil, surface water, and groundwater.

Table II-3-1
NEWIOU Site Descriptions
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name	Site Designation	Site Description
SD001	Union Creek	Site SD001 contains Union Creek and its associated surface water facilities that follow along the main airstrip. Grass and weeds growing along Union Creek are regularly mowed and tilled to prevent birds and other migratory animals from inhabiting the area. PAHs were identified in soil at SD001, and pesticides, PAHs, and metals were identified in the creek sediment. Pesticides and metals were identified in surface water at SD001.
FT002	FTA-1	Site FT002 consists of Fire Training Area 1, which was used for fire training exercises from 1943 to 1950. During these exercises, waste fuel, oils, and solvents were poured on frames or on the ground and burned. The site is currently an open grassy field. The contaminants detected in soil at FT002 are metals and SVOCs.
FT003	FTA-2	Site FT003 is in the northeastern portion of Travis AFB and consists of the former Fire Training Area 2. Waste fuel, oils, and solvents were burned at this site during fire training exercises from 1950 to 1962. A concrete helicopter pad covers part of the area. Contaminants detected in soil at FT003 include PAHs, metals, pesticides, PCBs, and dioxins.
FT004	FTA-3	Site FT004 covers approximately 30 acres in the northeastern portion of Travis AFB and consists of the former Fire Training Area 3. Waste fuel, oils, and solvents were burned at this site during fire training exercises from 1953 to 1962. The site is now an unused, open field. VOCs and metals have been identified as groundwater COCs. Soils at FT004 contain dioxins and metals.
FT005	FTA-4	Site FT005 covers approximately 30 acres in the southeastern portion of Travis AFB. The site includes the former Fire Training Area 4 used for fire training exercises from 1962 through approximately 1987. From 1962 until the early 1970s, waste fuels, oils, and solvents were burned at the site during training exercises. From the early 1970s until Fire Training Area 4 was closed, only waste fuels were burned. PCBs, metals, PAHs, dioxins, and pesticides have been identified in the soil at FT005. Groundwater contamination includes VOCs, SVOCs, and metals.
LF007	Landfill 2	Site LF007 is former Landfill 2 and occupies approximately 73 acres in the northeastern portion of Travis AFB. The landfill was operated in a trench-and-cover method beginning in the early 1950s through 1974. The landfill was used primarily for the disposal of general refuse, such as wood, glass, and construction debris. From the early 1950s until 1964, a portion of the eastern part of the landfill was used for storage of excess and waste materials, including oils, hydraulic fluid, and solvents for resale or disposal. Contaminants identified in soil at LF007 include PAHs, PCBs, SVOCs, and metals. Groundwater contamination includes VOCs, PCBs, dioxins, and SVOCs.
OT010	SDS	Site OT010 is in an inactive area in the southeastern portion of Travis AFB. It includes a sludge disposal site situated between Union Creek and multiple oxidation ponds. (The sludge originated from the on-base wastewater treatment plant.) Metals and pesticides have been identified in the soil at OT010.

Table II-3-1 (Cont'd)
NEWIOU Site Descriptions
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name	Site Designation	Site Description
SS015	SSA and Facilities 808, 1832, and 552	SS015 is in the northwestern part of the EIOU and consists of the SSA and Facilities 550 and 552. The SSA covers approximately 1.4 acres east of Facility 550 in an area previously used for stripping paint from aircraft. The site was an open grassy plot adjacent to an asphalt driveway and Facility 552. Facility 552 consisted of a fenced, bermed, concrete pad constructed in 1964 that was used as a temporary hazardous waste collection point. Stored wastes include paint, chromic acid, and solvents generated during aircraft maintenance operations at Facility 550 (Weston, 1995a). Facility 550 contained a corrosion control facility where aircraft parts and support equipment were treated and painted. A metals processing shop in Facility 550 used plating solutions containing cadmium. Facility 1832 is a 15,000-gallon OWS that received liquids generated at a wash rack on the aircraft parking apron. In 1992, a new hazardous waste accumulation facility was constructed at the site. In 2004, Facilities 550 and 552 were demolished to construct a POL MILCON project that consisted of an office building, a fuel truck maintenance facility, and a large concrete truck parking area.
SS016	OSA Facilities 11, 13/14, 20, 42/1941, 139/144, and SSRW	Site SS016 is in the central portion of Travis AFB and comprises the OSA, Facilities 11, 13/14, 20, 42/1941, 139/144, and the SSRW. The OSA covers approximately 7 acres north of Facility 16. The OSA originally encompassed an area where waste oil had reportedly been spilled or disposed of on a grassy area. The area is now paved. Oil spills, degreasing operations, leaking OWSs, equipment maintenance and repair, aircraft washing, hazardous waste storage, vehicle maintenance, storm water run-off, and a wash rack are the principal contamination sources in these areas. Chemicals handled include lubricating oils, hydraulic fluid, solvents, and water-containing solutions of these chemicals. PAHs and PCBs were identified in the soil at SS016. Groundwater contamination includes VOCs, SVOCs, and metals.
WP017	OPS	Site WP017 is in an inactive southeastern area of Travis AFB. Approximately 30% of the site is covered by sewage treatment plant oxidation ponds used from the 1950s to the late 1970s. Ponds along the southern base boundary were used from the late 1970s to 1990 for burial of construction materials and landscape debris. Contaminants identified in soils at WP017 include PCBs, metals, and pesticides.
SS029	Monitoring Well MW329x29 Area	Site SS029 consists of approximately 5.5 acres around MW329x29 in the southern part of Travis AFB, just south of the runway. PAHs, VOCs, and metals have been identified in the soil at SS029. VOCs have been identified as COCs in the groundwater at SS029.
SS030	Monitoring Well MW269x30 Area	Site SS030 covers approximately 1.6 acres around MW269x30, near the southern base boundary. The site is adjacent to a radar facility (Facility 1125); however, historical aerial photographs do not indicate any staining in the area or activities that may have been the source of contamination. Possible sources include a leachfield and/or surface disposal of TCE. VOCs and metals have been identified as COCs in the groundwater. Soils contain low levels of PAHs, metals, and VOCs.

Table II-3-1 (Cont'd)
NEWIOU Site Descriptions
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name	Site Designation	Site Description
ST032	Monitoring Well MW107x32 and MW246x32 Areas	The MW246x32 and MW107x32 area is in the southern portion of Site ST032, also known as the Plume B area, in the central part of the EIOU. The area consists of grassy, open areas between a runway and an abandoned taxiway. Land use is severely restricted due to the proximity of the runway. MW107x32 and MW246x32 are located in the area of the SSRW. Metals, SVOCs, and VOCs were identified in soils at ST032. VOCs, metals, and fuels have been identified in the groundwater at ST032.
SD033	SS II, South Gate Area, Facilities 810 and 1917, and West Branch of Union Creek	Site SD033 includes the west branch of Union Creek, parts of SS II (previously called Storm Sewer System B), Facilities 810 and 1917, the area around the South Gate, and Outfall II. These facilities are included as one site because past activities at either of these locations have been identified as a possible contaminant source for SS II. The Air Force used these areas to handle storm water runoff, fuel transport, aircraft maintenance, and aircraft washdown, including wash racks and OWSs. Chemicals used in these areas include fuels, lubricating oil, hydraulic fluids, chlorinated solvents, and soap solutions. The Air Force constructed Facility 1917 in 1956, and the facility is no longer in use. Facility 810 was constructed in 1955 and is currently used for aircraft maintenance. VOCs, SVOCs, and metals were identified in sediment at SD033. Analyses of surface soil and surface water samples identified metals. Groundwater contamination includes VOCs and fuels.
SD034	Facility 811	Site SD034 encompasses Facility 811 and includes an indoor wash rack that is used to wash aircraft. Chemicals used at this facility include acids, solvents, antifreeze, and the Stoddard solvent PD-680. Groundwater is contaminated with VOCs, SVOCs, and fuels. Soil is contaminated with fuels.
SS035	Facility 818/819	Site SS035 contains Facilities 818 and 819 and includes a wash area, an OWS and sump, a hydraulic lift storage area, and hazardous materials accumulation area. PCBs and metals were detected in the soil at SS035. Groundwater at this site contains VOCs and fuels.
SD036	Facility 872/873/876	Site SD036 includes Facilities 872, 873, and 876. The site, while mostly paved, is surrounded by buildings and is situated in an active area of the Base. These facilities were constructed as multiple use shops, which have included a wash rack and an OWS. Current uses of the facilities include paint shops, electrical shops, landscape maintenance, paint mixing, and paint accumulation. Chemicals used include cleaning solutions, grease, degreasers, hydraulic oils and fluids, PD-680, pesticides, paints, and solvents. The Air Force constructed the shops in 1953, and they are still in use. The groundwater at this site is contaminated with VOCs and fuel. Soil is contaminated with fuels.
SD037	Sanitary Sewer System, Facilities 837/838, 919, 977, 981, Ragsdale/V Area, and Area G Ramp	SD037 contains Sanitary Sewer System Facilities 837/838, 919, 977, 981, Ragsdale/V Area, and Area G Ramp. These facilities are involved in handling domestic and industrial wastewater, aircraft maintenance, heavy equipment maintenance, air cargo, vehicle washing, fuel transport, and waste accumulation. Chemicals used and handled in these areas include wastewater, oils, hydraulic fluids, fuels, transformer fluids, and chlorinated solvents. The Air Force began operating these facilities in the 1940s and continues operations to the present day. Groundwater at SD037 contains VOCs and fuels. Contaminants identified at the site include PAHs, fuels, SVOCs, and metals.

Note: Dioxins/furans exist in a number of different forms (congeners). Each of these congeners is more or less toxic than the others. To simplify reporting, all of the different congeners are converted into an equivalent amount of 2,3,7,8-TCDD using Toxicity Equivalence Factors developed by U.S. EPA, and the total amount of dioxins/furans is reported as 2,3,7,8-TCDD(eq).

COC	=	contaminant of concern
EIOU	=	East Industrial Operable Unit
FTA	=	fire training area
MILCON	=	military construction
MW	=	monitoring well
NEWIOU	=	North/East/West Industrial Operable Unit
OPS	=	oxidation pond site
OSA	=	oil spill area
OWS	=	oil/water separator
PAH	=	polycyclic aromatic hydrocarbon
PCB	=	polychlorinated biphenyls
POL	=	petroleum, oil, and lubricants
ROD	=	record of decision
SDS	=	sludge disposal site
SSA	=	solvent spill area
SS II	=	Storm Sewer II
SSRW	=	storm sewer right-of-way
SVOC	=	semivolatile organic compound
TCDD(eq)	=	tetrachlorodibenzo-p-dioxin equivalent
TCE	=	trichloroethene
U.S. EPA	=	United States Environmental Protection Agency
VOC	=	volatile organic compound

For the two sites with surface water contamination (SD001 and SD033), the surface water COPECs identified by sampling and analysis were metals. Using weight of evidence analysis, metals and pesticides were identified as surface water COPECS for SD001.

Sediment contamination was identified at Sites SD001 and SD033. The COCs/COPECs identified in sediment include VOCs, pesticides, metals, and PAHs.

Table II-3-2 summarizes the COCs/COPECs identified in soil, sediment, and surface water during the RIs. Table II-3-3 presents the COPECs identified during the EIOU RI using weight of evidence analysis. These tables are provided at the end of Section 3.2.

Table II-3-2 presents the soil COCs and COPECs at each site identified during the RIs, the maximum concentrations detected, the maximum human health risk values, and the maximum ecological risk values (HQs) associated with each contaminant, as calculated during the RIs. When reading this table, it is important to realize that it contains information derived from three different RIs, each of which used slightly different approaches to determining human health and ecological risks. In addition, the maximum contaminant concentration at a soil site does not necessarily result in the maximum potential risk posed by the contaminant. For example, a high concentration of a contaminant at the bottom of a former 6-foot trench would not result in a high ecological risk because most of the ecological receptors live in the top 4 feet of topsoil. Using the same example, a surface soil contaminant may pose the highest potential human health risk, given a higher probability for exposure, even though the highest contaminant concentration is found in the subsurface soil.

The significance of Table II-3-2 is that it lists those sites that warranted further evaluation in the FS (as described in Section 4.0). This ROD, through the Human Health Tech Memo and Eco Tech Memo, evaluated risks to human and ecological receptors using more comprehensive site data and a consistent methodology and determined whether further action was necessary at those sites (as described in Section 5.0).

3.2 Risk Assessments

As part of the RIs, an HHRA and an ERA were conducted for each site. The HHRA and ERA are summarized hereafter.

3.2.1 Human Health Risk Assessment (HHRA)

An HHRA estimates the likelihood that health problems would occur if no cleanup action were taken at a site. This "baseline risk assessment" is a four-step process:

- Step 1: Analyze Contamination
- Step 2: Estimate Exposure
- Step 3: Assess Potential Health Effects
- Step 4: Characterize Site Risk

Step 1 considers the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies are used to determine which contaminants are most likely to pose the greatest threat to human health. These are called contaminants of potential concern (COPCs).

Step 2 considers the different ways (scenarios or pathways) that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, exposure point concentrations (EPCs) are calculated.

At Step 3, the information from Step 2 is combined with information on the toxicity of each chemical to assess potential health risks. There are two types of human health effects: cancer (carcinogenic) risk and non-cancer (noncarcinogenic) hazards. The likelihood of any kind of cancer resulting from a site, called the lifetime excess cancer risk (LECR), is expressed as an upper bound probability; for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person out of the population could get cancer than would normally be expected from all other causes. This increase is very small, considering that the background rate of cancer from all causes in the United States is approximately 1 in 2 (0.5) for men and 1 in 3 (0.33) for women. For non-cancer health effects, an HI is calculated. The key concept here is that a "threshold level" (measured usually as an HI of less than 1) exists, below which non-cancer health effects (i.e., health problems other than cancer) are no longer predicted.

Step 4 determines whether site risks are great enough to cause health problems for people at or near the site. The results of the three previous steps are combined, evaluated and summarized.

N

0 2200

Scale in Feet

Duck Pond

SD033 West Branch of Union Creek

LF007

LF006

SD031

FT004

FT003

FT002

SS015

SD034

SD033

SS035

SS016

ST032

Outfall 4

OT010

SD001

Outfall 3

SS029

WP017

SD036

SD037

SS030

FT005

SD001 Main Branch of Union Creek

Outfall 2

Legend

- Area of Soil Contamination
- Union Creek (Above ground)
- Union Creek (Underground)
- Outfall Location
- Boundary of ERP Site Included in the Feasability Study (FS)
- NEWIOU Boundary
- Base Boundary

Figure II-3-1
Estimated Areas of Soil Contamination for Consideration in the NEWIOU FS

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The potential risks from the individual contaminants and pathways are added together to determine a total site risk.

The three RI reports present detailed discussions of the HHRA at NEWIOU sites. The results of the HHRAs are summarized in Table II-3-2 included at the end of Section 3.2. The table provides maximum ecological risk value and maximum human health cancer risk value for each COC/COPEC. Human health non-cancer HIs are not included because there were no HIs (human health non-cancer) greater than 1 for soil, sediment, or surface water COCs in the RIs.

3.2.2 Ecological Risk Assessment

ERAs were completed for each of the three OUs. The overall purpose of an ERA is to provide a qualitative and quantitative evaluation of the actual or potential effects of contaminants on plants and animals (other than humans and domesticated species).

- The EIOU ERA evaluated potential total ecological risks to flora and fauna exposed to contaminants in the EIOU, including off-base portions of Union Creek. A two-tiered approach was used to assess the potential ecological impacts from chemicals at the Base. Tier I was a strictly model-based screening approach for assessing potential impacts. Tier II consisted of a variety of site-specific field and laboratory studies designed to improve the estimate of potential risks occurring at the site and, where appropriate, to verify the results of modeled risks (Weston, 1995b). Several areas of concern that were identified as having COPECs were given a site designation and recommended for further evaluation in the FS. The results of the EIOU ERA are summarized in Tables II-3-2 and II-3-3. The screening for COPECs is based on an HQ greater than 1. An HQ takes into account the potential exposure and toxicity of a chemical for ecological receptors, and an HQ of less than 1 indicates adverse impacts are unlikely to occur as a result of exposure to a particular chemical.

- The NOU and WIOU ERAs focused on the potential for exposure and risk from chemical contamination (i.e., chemical stressors) to terrestrial and aquatic flora and fauna that inhabit, or potentially inhabit, sites in the NOU and the WIOU at Travis AFB (Radian, 1995; Radian, 1996a). Both the NOU and the WIOU ERAs used a multi-tiered approach (JEG, 1994a), referred to as Tiers I and II. The Tier I Scoping and Qualitative Assessment (JEG, 1994b) identified ecological receptors, potentially complete exposure pathways, and sampling requirements to evaluate potential exposures. The Tier II analyses for the NOU and the WIOU were presented in their respective RI Reports (Radian, 1995; Radian, 1996a). The results of the EIOU ERA are summarized in Table II-3-2. Areas of concern that were identified as having COPECs were given a site designation and recommended for further evaluation in the FS.

- Following the completion of the OU-specific ERAs, a document entitled, *Final Comprehensive Basewide Ecological Risk Assessment - Tier 2 Screening Assessment, Travis Air Force Base, California* (CH2M HILL, 1996), designed to quantify the potential ecological risks to plants and animals on the Base using a basewide perspective, was completed.

Table II-3-2
Summary of Contaminants of Concern, Contaminants of Potential Ecological Concern, and Potential Risks at NEWIOU Soil, Sediment, and Surface Water Sites Identified in the RIs
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	COC/COPEC	Maximum Concentration (mg/kg)	Maximum Human Health Cancer Risk Value*	Maximum Ecological Risk Value (HQ)
NOU				
LF007 (Landfill 2 Area B)	Benzo(a)anthracene	7.73	1.8×10^{-5}	NA
	Benzo(a)pyrene	7.0	1.6×10^{-4}	NA
	Benzo(b)fluoranthene	12.6	2.9×10^{-5}	NA
	Benzo(k)fluoranthene	12.6	2.9×10^{-6}	NA
	Dibenzo(a,h)anthracene	1.02	2.4×10^{-5}	NA
	Indeno(1,2,3-cd)pyrene	1.37	3.2×10^{-6}	NA
LF007 (Landfill 2 Area D)	PCB-1260	0.986	4.0×10^{-5}	NA
	Benzo(a)pyrene	0.55	8.8×10^{-6}	NA
	Benzo(b)fluoranthene	1.12	1.2×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.03	4.6×10^{-6}	NA
LF007 (Landfill 2 Area E)	PCB-1260	336	7.1×10^{-4}	NA
	Arsenic	33.4	7.2×10^{-5}	NA
LF007 (Landfill 2)	Antimony	32.5	NA	HQ >1,000
	Cadmium	11.9	NA	10 <HQ <100
	Copper	72	NA	10 <HQ <100
	Mercury	0.554	NA	1 <HQ <10
	Molybdenum	21.4	NA	100 <HQ <1,000
	Lead	343	NA	10 <HQ <100
	Silver	39.7	NA	1 <HQ <10
	Vanadium	195	NA	10 <HQ <100
	Zinc	1,200	NA	100 <HQ <1,000
	PCB-1260	336	NA	1 <HQ <10
WIOU				
SD033 (SS II)	Lead	433	NA	HQ:1-10
	Mercury	1.28	NA	HQ:1-10
	Zinc	315	NA	HQ:1-10
	<u>(Sediment)</u>			
	Acetone	2.5	NA	HQ:10-100
	2-Butanone	16	NA	HQ:1-100
	Carbon disulfide	0.56	NA	HQ:10-100
	Benzo(a)anthracene	3.66	NA	HQ:1-10
	Benzo(a)pyrene	4.04	NA	HQ:1-10
	Benzo(b)fluoranthene	7.7	NA	HQ:1-10
	Dibenzo(a,h)anthracene	0.362	NA	HQ:1-10
	Pyrene	4.44	NA	HQ:1-10
	Chrysene	4.34	NA	HQ:1-10
	Anthracene	2.8	NA	HQ:1-10
	Fluorene	1.19	NA	HQ:1-10
	Indeno(1,2,3-c,d)pyrene	1.22	NA	HQ:1-10
	Cadmium	13	NA	HQ:1-10
	Molybdenum	5.76	NA	HQ:1-10
	Nickel	63.6	NA	HQ:1-10

Table II-3-2 (Cont'd)
Summary of Contaminants of Concern, Contaminants of Potential Ecological Concern, and Potential Risks at NEWIOU Soil, Sediment, and Surface Water Sites Identified in the RIs
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	COC/COPEC	Maximum Concentration (mg/kg)	Maximum Human Health Cancer Risk Value*	Maximum Ecological Risk Value (HQ)
WIOU (cont'd)	(Surface Water)			
	Barium	0.135 mg/L (dissolved)	NA	HQ:10-100
	Copper	0.0304 mg/L (dissolved)	NA	HQ:1-10
	Lead	0.248 mg/L (dissolved) 0.0596 mg/L (total)	NA	HQ:1-10
SD034 (Facility 811)	TPH-purgeable	15,900	> Guidance**	NA
	TPH-extractable	11,600	> Guidance**	NA
SS035 (Facility 818/819)	Molybdenum	46.4	NA	HQ:1-10
	Silver	86	NA	HQ:10-100
	Vanadium	220	NA	HQ:1-10
	Aroclor	0.523	7.9×10^{-6}	NA
SD036 (Facility 872/873/876)	TPH-purgeable	292	> Guidance**	NA
	TPH-extractable	621	> Guidance**	NA
SD037 (Facility 981)	Benzo(a)anthracene	1.68	4.3×10^{-6}	NA
	Benzo(a)pyrene	1.4	5.1×10^{-5}	NA
	Benzo(b)fluoranthene	1.3	5.4×10^{-6}	NA
	bis(2-Ethylhexyl)phthalate	0.309	1.1×10^{-7}	NA
	Benzo(k)fluoranthene	1.99	1.5×10^{-5}	NA
	Cadmium	1.53	NA	HQ:1-10
	Indeno(1,2,3-cd)pyrene	0.0227	2.8×10^{-6}	NA
	Copper	50.7	NA	HQ:1-10
	Lead	410	NA	HQ:1-10
	Mercury	0.922	NA	HQ:1-10
	Molybdenum	37.6	NA	HQ:1-10
	Zinc	362	NA	HQ:1-10
EIOU				
SD001 (Union Creek)	(Sediment)			
	Benzo(a)pyrene	25	5.5×10^{-5}	NA
	(Surface Water)			
	Aluminum	0.544 mg/L	NA	HQ >10
FT002 (FTA-1)	Lead	853	NA	HQ for metals >10
	Chromium	66.6		
	Mercury	4.62		
	Selenium	3.56		
	Silver	8.25		
	di-n-Butyl phthalate	0.71	NA	>1

Table II-3-2 (Cont'd)
Summary of Contaminants of Concern, Contaminants of Potential Ecological Concern, and Potential Risks at NEWIOU Soil, Sediment, and Surface Water Sites Identified in the RIs
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	COC/COPEC	Maximum Concentration (mg/kg)	Maximum Human Health Cancer Risk Value*	Maximum Ecological Risk Value (HQ)
EIOU (cont'd)				
FT003 (FTA-2)	Boron	94.3	NA	HQ for metals >10
	Cadmium	10.7		
	Lead	686		
	gamma-Chlordane	0.208	NA	HQ for pesticides and dioxins >1
	Methoxone	17		
	2,3,7,8-TCDD (eq) [a]	2.1×10^{-6}		
	Benzo(k)fluoranthene	46.7	>PRG***	NA
	Benzo(a)anthracene	25.4	>PRG***	NA
	Dibenzo(a,h)anthracene	2.84	>PRG***	NA
	Benzo(a)pyrene	27.5	>PRG***	NA
	Indeno(1,2,3-c,d)pyrene	14.4	>PRG***	NA
FT004 (FTA-3)	Copper	2,450	NA	HQ for metals >10
	Antimony	167		
	Cadmium	6.7		
	Lead	750		
	Zinc	402		
	2,3,7,8-TCDD (eq) [a]	1.6×10^{-1}	1.4×10^{-3}	HQ >1
FT005 (FTA-4)	Barium	1,940	NA	HQ for metals >10
	Chromium	393		
	Copper	111		
	Lead	337		
	Cadmium	14.2		
	Nickel	347		
	Selenium	206		
	Zinc	353		
	Pyrene	59.9	2.0×10^{-3} for PAH and PCB	NA
	Arochlor-1254	1.09		
	Methoxone	21	NA	HQ for pesticides >1
	DDE	0.199		
	2,3,7,8-TCDD(eq) [a]	2.08****	NA	HQ >1
	Dibenzo(a,h)anthracene	0.923	>PRG***	NA
	Benzo(a)anthracene	33.3	>PRG***	NA
	Benzo(a)pyrene	34.6	>PRG***	NA
	Benzo(b)fluoranthene	55.4	>PRG***	NA
	Indeno(1,2,3-c,d)pyrene	9.36	>PRG***	NA
	Benzo(k)fluoranthene	55.4	>PRG***	NA
OT010 (SDS)	Mercury	1.77	NA	HQ for metals >10
	Silver	18.7		
	Zinc	179		
	Copper	49.7		
	DDE	0.0918	NA	HQ >1

Table II-3-2 (Cont'd)
Summary of Contaminants of Concern, Contaminants of Potential Ecological Concern, and Potential Risks at NEWIOU Soil, Sediment, and Surface Water Sites Identified in the RIs
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	COC/COPEC	Maximum Concentration (mg/kg)	Maximum Human Health Cancer Risk Value*	Maximum Ecological Risk Value (HQ)
EIOU (cont'd)				
SS015 (Facility 552)	Molybdenum	12.3	NA	HQ for metals >10
	Antimony	21.1		
	Cadmium	22.5		
	Chromium	6,740.0		
	Copper	94.1		
	Lead	28,200.0		
	Zinc	783.0		
	Mercury	0.345		
	Silver	2.74		
	Benzo(a)anthracene	6.14	>PRG***	NA
	Benzo(a)pyrene	5.89	>PRG***	NA
	Benzo(b)fluoranthene	11.7	>PRG***	NA
	Dibenzo(a,h)anthracene	1.06	>PRG***	NA
SS016 (OSA, Facilities 11, 13/14, 20, 42/1941, and 139/144)	Arochlor-1260	0.452	8.8×10^{-3} for PAH and PCB	NA
	Fluoranthene	7.71		
	Benzo(a)pyrene	3.75	>PRG***	NA
	Benzo(b)fluoranthene	9.06	>PRG***	NA
	Dibenzo(a,h)anthracene	0.49	>PRG***	NA
WP017 (OPS)	alpha-Chlordane	0.224	NA	HQ for pesticides >1
	gamma-Chlordane	0.417		
	DDD	1.81		
	DDE	0.633		
	Aluminum	32,700	NA	HQ for metals >10
	Cadmium	12		
	Chromium	119		
	Copper	159		
	Mercury	9.16		
	Molybdenum	9.4		
	Nickel	103		
	Selenium	37.3		
	Silver	127		
	Zinc	553		
	Arochlor-1260	1.08	6.6×10^{-4}	NA

Table II-3-2 (Cont'd)
Summary of Contaminants of Concern, Contaminants of Potential Ecological Concern, and Potential Risks at NEWIOU Soil, Sediment, and Surface Water Sites Identified in the RIs
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	COC/COPEC	Maximum Concentration (mg/kg)	Maximum Human Health Cancer Risk Value*	Maximum Ecological Risk Value (HQ)
EIOU (cont'd)				
SS029 (MW329x29 Area)	TCE	0.123	Combined risk for all SS029 COCs = 2.0×10^{-6}	NA
	bis(2-Ethylhexyl)phthalate	0.123		
	2-Methylnaphthalene	0.149		
	Benzo(a)anthracene	0.0393		
	Benzo(a)pyrene	0.0346		
	Benzo(b)fluoranthene	0.0925		
	Benzo(k)fluoranthene	0.0925		
	Chrysene	0.0545		
	Fluoranthene	0.038		
	Indeno(1,2,3-cd)pyrene	0.0222		
	Naphthalene	0.0323		
	Pyrene	0.0383		
	Antimony	12.5		
	Beryllium	0.856		
	Cadmium	1.12		
	Cobalt	42.7		
	Copper	54.4		
	Magnesium	11,600		
	Manganese	2,400		
	Nickel	47.6		
	Zinc	109		
SS030 (MW269x30 Area)	Toluene	0.00271	Combined risk for all SS030 COCs = 6.4×10^{-5}	NA
	Xylenes	0.00425		
	1,1,1-TCA	0.00537		
	TCE	0.197		
	MEK	0.0181		
	Benzo(a)anthracene	0.0393		
	Benzo(a)pyrene	0.0498		
	Benzo(b)fluoranthene	0.0773		
	Benzo(k)fluoranthene	0.0804		
	Chrysene	0.0614		
	Fluoranthene	0.078		
	Phenanthrene	0.193		
	Pyrene	0.148		
	Benzyl butyl phthalate	0.177		
	bis(2-Ethylhexyl)phthalate	1.1		
	Antimony	37.6		
	Beryllium	0.946		
	Barium	1,350		
	Chromium	58.5		
	Copper	106		
	Lead	97.4		
	Magnesium	11,300		

Table II-3-2 (Cont'd)
Summary of Contaminants of Concern, Contaminants of Potential Ecological Concern, and Potential Risks at NEWIOU Soil, Sediment, and Surface Water Sites Identified in the RIs
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	COC/COPEC	Maximum Concentration (mg/kg)	Maximum Human Health Cancer Risk Value*	Maximum Ecological Risk Value (HQ)
EIOU (cont'd)				
SS030 (MW-269 Area) (cont'd)	Nickel	51.2	Combined risk for all SS030 COCs = 6.4×10^{-5}	NA
	Selenium	148		
	Zinc	392		
ST032 (MW107x32 and MW246x32 Areas)	Benzene	12.6	Combined risk for all ST032 COCs = 1.3×10^{-5}	NA
	1,1-DCE	0.0049		
	TCE	0.0015		
	Benzo(a)pyrene	0.034		
	Benzo(b)fluoranthene	0.0692		
	Chrysene	0.0394		
	Indeno(1,2,3-cd)pyrene	0.024		
	alpha-Chlordane	0.000356		
	Aroclor-1260	0.0292		
	Arsenic	14.9		
	Cadmium	2.57		
	Copper	66.4		
	Nickel	54.7		

Notes: COCs and COPECs are from Tables 1-2, 1-3, and 1-5 in the NEWIOU FS (Radian, 1996b). Analytical data for the EIOU, NOU, and WIOU sites are from their respective RIs.

Samples were collected from soil borings, surface samples, hand augers, and dry and wet sediment.

[a] Dioxins/furans exist in a number of different forms (congeners).Each of these congeners is more or less toxic than the others. To simplify reporting, all of the different congeners are converted into an equivalent amount of 2,3,7,8-TCDD using Toxicity Equivalence Factors developed by U.S. EPA, and the total amount of dioxins/furans is reported as 2,3,7,8-TCDD(eq).

* Maximum human health cancer risk is based on a residential scenario at NOU sites and an industrial scenario at WIOU and EIOU sites. Residential cancer risk was used for NOU sites because a trailer park was located on a portion of LF006 in the NOU when the RI was conducted. In the RIs, there were no hazard indices (human health non-cancer) greater than 1 for soil, sediment, or surface water COCs.

** In the WIOU RI, in the absence of ARARs, TPH concentrations were screened against values in the *Leaking Underground Fuel Tank (LUFT) Field Manual* (State of California Water Resources Control Board, 1989) as a TBC.

*** These analytes exceed U.S. EPA Region 9 Industrial PRGs (Smucker, 2000). In the EIOU RI, pyrene or fluoranthene were used to represent PAHs. The PAHs noted in human health risk value column as "> PRG" are the actual COCs to be addressed.

**** Maximum 2,3,7,8-TCDD(eq) concentration determined to be 1.4×10^{-5} mg/kg in review of EIOU contaminants.

ARAR = applicable or relevant and appropriate requirements
COC = contaminant of concern
COPEC = contaminant of potential ecological concern
DCE = dichloroethene
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
EIOU = East Industrial Operable Unit
FS = Feasibility Study
FTA = Fire Training Area
HQ = Hazard Quotient
MEK = methyl ethyl ketone
mg/kg = milligram per kilogram
mg/L = milligram per liter
NA = not available
NEWIOU = North/East/West Industrial Operable Unit
NOU = North Operable Unit
OPS = oxidation pond site
OSA = Oil Spill Area
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
PRG = Preliminary Remediation Goal
RI = remedial investigation
ROD = record of decision
SDS = sludge disposal site
TCA = trichloroethane
TCDD(eq) = tetrachlorodibenzo-p-dioxin equivalent
TCE = trichloroethene
TPH = total petroleum hydrocarbon
U.S. EPA = United States Environmental Protection Agency
WIOU = West Industrial Operable Unit

Table II-3-3
Contaminants of Potential Ecological Concern at EIOU Soil, Sediment, and Surface Water Sites, Identified by Weight of Evidence Analysis
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site Name (Designation)	Medium	Contaminant of Potential Ecological Concern
SD001	Sediment	Cadmium
		Lead
		Mercury
		Molybdenum
		Nickel
		Silver
		Zinc
		Benzo(a)anthracene
		Benzo(a)pyrene
		Chrysene
		Dibenzo(a,h)anthracene
		Phenanthrene
		Pyrene
		Chlordane
		DDD
		DDE
		Dieldrin
	Surface Water	Aluminum
		Selenium
		Silver
		Chlordane
		Dieldrin
		Beta endosulfan
FT003	Surface Water (vernal pool)	Aluminum

Notes:

Source of COPECs: Table 1-4 in the NEWIOU FS (Radian, 1996b).
Samples were collected from soil borings, surface samples, hand augers, and dry and wet sediment.

COPEC	=	contaminant of potential ecological concern	FS	=	feasibility study
DDD	=	dichlorodiphenyldichloroethane	NEWIOU	=	North/East/West Industrial Operable Unit
DDE	=	dichlorodiphenyldichloroethene	ROD	=	record of decision
EIOU	=	East Industrial Operable Unit			

3.3 Site Descriptions

This section provides a description and history for each NEWIOU site. It describes the COCs and/or COPECs for surface and subsurface soil, sediment, and surface water that were identified during the RIs.

3.3.1 SD001 (Union Creek)

SD001 contains Union Creek and its associated surface water facilities that follow along the main airstrip. The site extends from Outfall IV in the north to Outfall I at the southwestern

border of the Base, including (from north to south) Outfall III and Outfall V. Travis AFB storm sewer systems discharge into Union Creek within Site SD001 at Outfalls III and IV.

The only COC in soil is the polycyclic aromatic hydrocarbon (PAH) benzo(a)pyrene. The HHRA is presented in the EIOU RI (Weston, 1995a). Contaminated soil also includes a soil pile near Union Creek at the eastern end of FT005.

Aluminum was the only COPEC identified in surface water at Union Creek by sampling and analysis in the RI (as shown on Table II-3-2). In addition to this COPEC, the EIOU ERA identified other metals and pesticides as COPECs using a weight of evidence analysis to relate toxic effects with chemicals identified at the site, instead of an HQ analysis. These other COPECs are listed in Table II-3-3.

3.3.2 FT002 (Fire Training Area 1)

FT002 consists of the Fire Training Area 1 (FTA-1), used for fire training exercises from 1943 to 1950 (Weston, 1995a). During these exercises, waste fuel, oils, and solvents were dumped onto frames or on the ground and burned. The site is now an open grassy field.

No COCs in soil were associated with human health risk at FT002. COPECs in the soil at the site are associated with ecological receptors and include lead and di-n-butyl phthalate. There are no other affected media at this site.

3.3.3 FT003 (Fire Training Area 2)

FT003 is located in the northeastern portion of the EIOU and consists of old FTA-2. The site was used for fire training exercises from 1950 to 1952 (Weston, 1995a). During these exercises, waste fuel, oils, and solvents were dumped onto frames or on the ground and burned. A concrete helicopter pad covers part of the site.

COCs found in the soil during the RI conducted at the site include PAHs, which pose a human health risk. COPECs in soil include lead, gamma chlordane, and dioxin, which pose a potential risk to ecological receptors. A comprehensive list of COCs is provided in Section 5.0. There are no other affected media at this site.

3.3.4 FT004 (Fire Training Area 3)

FT004 covers approximately 30 acres in the northeastern portion of the EIOU and consists of the old FTA-3. The site was used for fire training exercises from 1953 to 1962 (Weston, 1995a). During these exercises, waste fuel, oils, and solvents were dumped onto frames or onto the ground and burned. The site is now an unused, open field.

Dioxin is a COC at this site, and it poses a risk to human health. COPECs in soil include lead, copper, antimony, cadmium, and zinc, which pose a potential risk to ecological receptors. A comprehensive list of COCs and contaminants of ecological concern (COECs) is provided in Section 5.0. Groundwater contamination at the site includes TCE, 1,2-dichloroethane (DCA), cis-1,2-dichloroethene (DCE), chloroform, dichlorobromomethane, bis(2-ethylhexyl)phthalate, and nickel.

3.3.5 FT005 (Fire Training Area 4)

FT005 covers approximately 30 acres in the southeastern portion of the EIOU. The contaminated soil includes approximately 6.5 acres. The site includes the former Fire Training Area 4 (FTA-4), used for fire training exercises from 1962 through approximately 1987. Aerial photographs indicate that the area may have been used for munitions storage prior to 1958 (Weston, 1995a). From 1962 until the early 1970s, waste fuels, oils, and solvents were burned at the site during training exercises. From the early 1970s until FTA-4 was closed, only waste fuels were burned. An aboveground storage tank (AST) was installed in 1976 to hold the waste fuels, and it is still located at the site. The site had no berms or dikes to contain runoff, and surface runoff may have flowed into Union Creek.

COCs found during the EIOU RI (Weston, 1995a) include pyrene and aroclor-1254. COPECs include dioxins, methoxone, and metals. The COCs and COECs in surface and subsurface soils, which pose a human health risk and potential ecological risk, are presented in Section 5.0. Groundwater contamination at the site includes TCE, 1,2-DCA, cis-1,2-DCE, chloroform, dichlorobromomethane, and nickel. An interim remedial groundwater extraction system has been in operation since July 1998 (CH2M HILL, 2001).

3.3.6 LF007 (Landfill 2)

LF007 is located at old Landfill 2 and occupies approximately 73 acres in the NOU. The landfill was operated in a trench-and-cover method beginning in the early 1950s, following the closure of Landfill 1. The landfill was used primarily for the disposal of general refuse, such as wood, glass, and construction debris. Small amounts of industrial wastes and fuel sludge from tank cleaning operations also were reportedly disposed of at Landfill 2 (Radian, 1995). Use of Landfill 2 ceased in 1974. From the early 1950s until 1964, a portion of the eastern part of the landfill was used to store excess and waste materials, including oils, hydraulic fluid, and solvents, for resale or disposal. As determined by aerial photographs, a skeet range also was located at the site around 1953; however, the exact dates of operation are not known (Radian, 1995). Current operations at the site are limited to those conducted at Buildings 1360, 1365, and 1370. Building 1360 is the Affiliate Radio System; Building 1365 is used for hazardous waste storage; and Building 1370 houses the Small Arms Range. During the NOU RI (Radian, 1995), soil contamination was found in four areas of the site, referred to as Areas B, D, E, and G. COCs found in the soil at Area B include PAHs (benzo[a]pyrene). COCs found at Area D include PCBs (aroclor) and PAHs (benzo[b]fluoranthene). Area E COCs include metals and PCBs. Area G, which includes the remaining portion of Landfill 2, has metals contamination. In addition, PCBs, SVOCs, VOCs, and dioxins were found in the groundwater at the former landfill. A list of COCs identified at Landfill 2 that pose a human health risk is provided in Section 5.

As part of the WABOU Soil ROD, a Corrective Action Management Unit (CAMU) was designated and established on this site in 2002. A CAMU is a designated area within a facility that is designed to carry out a corrective action, such as the management of contaminated soil. The CAMU is an important strategy at Travis AFB for the on-base consolidation of contaminated soil. It is proposed in this ROD that NEWIOU soils be consolidated in the CAMU. Section 4.4 discusses the CAMU in more detail.

3.3.7 OT010 (Sludge Disposal Site)

OT010 is located in an inactive area in the southeastern portion of the EIOU. It consists of the sludge disposal site (SDS) situated between Union Creek and multiple oxidation ponds.

Potential human health risk is associated with PAH-contaminated soil at the site. Soil COPECs that could affect ecological receptors include mercury, zinc, silver, and copper. The pesticide dichlorodiphenyldichloroethene (DDE) also was detected. There are no other affected media at this site.

3.3.8 SS015 (Solvent Spill Area and Facilities 550 and 552)

SS015 is in the northwestern part of the EIOU and comprises the Solvent Spill Area (SSA) and Facilities 550 and 552. The SSA covers approximately 1.4 acres east of Facility 550, in an area previously used for stripping paint from aircraft. Solvent spills were reported to have occurred in the area east of Facility 550. The site was an open grassy plot adjacent to an asphalt driveway and Facility 552.

Facility 552 consisted of a fenced, bermed, concrete pad constructed in 1964 that was used as a temporary hazardous waste collection point. Stored wastes included paint, chromic acid, and solvents generated during aircraft maintenance operations at Facility 550 (Weston, 1995a).

Facility 550 contained a corrosion control facility that treated and painted aircraft parts and support equipment. A metals-processing shop in Facility 550 used plating solutions containing cadmium. Facility 1832 is a 15,000-gallon OWS that received liquids generated at a wash rack on the aircraft parking apron. In 1992, a new hazardous waste accumulation facility was constructed at the site.

In 2004, Facilities 550 and 552 were demolished to construct a POL (petroleum, oil, and lubricants) MILCON (Military Construction) project that consisted of an office building, a fuel truck maintenance facility, and a large, concrete truck-parking area. The details of this construction activity and an associated soil removal action are discussed in Section 5.3.8.

During the EIOU RI (Weston, 1995a), soil contamination that posed a potential human health risk was identified at SS015. COCs in the soil include PAHs. COPECs identified as posing a risk to ecological receptors include the metals molybdenum, antimony, cadmium, chromium, copper, lead, zinc, mercury, and silver. Additional contaminants at the site include VOCs, SVOCs, and metals in the groundwater. The interim remedial groundwater action at SS015 is monitored natural attenuation (MNA) and enhanced biodegradation.

3.3.9 SS016 (Oil Spill Area and Facilities 11, 13/14, 20, 42/1941, 139/144, and Storm Sewer Right-of-Way)

SS016 is in the center of the EIOU and comprises the Oil Spill Area (OSA) and Facilities 11, 13/14, 20, 42/1941, 139/144, and the Storm Sewer Right-of-Way (SSRW). The OSA covers approximately 7 acres north of Facility 16. The OSA originally encompassed a grassy area in which waste oil had reportedly been spilled or disposed. The area is now paved. The facilities within the site support repair of flightline service equipment, aircraft, and engines, fuel storage,

aircraft wash racks, and vehicle maintenance. A variety of solvents, hydraulic fluids, oils, fuels, and other materials are associated with these activities.

COCs found in the soil at the site during the EIOU RI (Weston, 1995a) include PAHs and PCBs. No risks to ecological receptors were identified. Groundwater COCs were identified as predominantly VOCs, including TCE, DCE, and vinyl chloride. An interim remedial groundwater extraction system has been in operation since December 1997 and was enhanced by the addition of two extraction wells in 2001.

3.3.10 WP017 (Oxidation Pond Site)

WP017 is in an inactive southeastern area of the Base. It consists of the oxidation pond site (OPS). Approximately 30% of the site is covered by sewage treatment plant oxidation ponds that were in use from the 1950s to the late 1970s. The treatment plant processed domestic and industrial wastes. In the late 1970s, Base wastes were transferred to the Fairfield-Suisun Sewer District for treatment (Engineering-Science, Inc. [ESI], 1983). Ponds along the southern Base boundary were used from the late 1970s to 1990 for burial of construction materials, old tires, paint and oil containers, and landscape debris (Harding Lawson Associates, 1993).

PCBs in soil were identified as COCs during the EIOU RI (Weston, 1995a). COPECs include metals and pesticides. There are no other affected media at this site.

3.3.11 SS029 (Monitoring Well MW329x29 Area)

SS029 consists of approximately 5.5 acres around monitoring well (MW) MW329x29 in the southern part of the EIOU, just south of the runway. The monitoring well was installed to evaluate the source of the TCE plume identified at MW269x30 in SS030. Analytical results from groundwater samples collected at MW329x29 suggest that there was a contaminant source in this area (Weston, 1995a). Historical aerial photographs of the area show aircraft parked in the area; however, activity appears limited, and no source of the plume has been identified.

COCs identified in the EIOU RI (Weston, 1995a) include various VOCs, SVOCs, PAHs, and metals. No COPECs were identified as posing a risk to ecological receptors. Contaminants, such as TCE, 1,2-DCA, benzene, and vinyl chloride, were identified in the groundwater at the site during the RI. An interim remedial groundwater extraction system has been operating since November 1998 (CH2M HILL, 2001).

3.3.12 SS030 (Monitoring Well MW269x30 Area)

SS030 covers approximately 1.6 acres in the area around monitoring well MW269x30 in the southern portion of the EIOU, near the southern Base boundary. The monitoring well was originally installed to evaluate water quality along the Base boundary (Weston, 1995a). The site is adjacent to a radar facility (Facility 1125); however, historical aerial photographs do not indicate any staining in the area or activities that may have been the source of contamination.

COCs found in the soils at the site include low levels of several VOCs, SVOCs, PAHs, and metals. Lead was identified as posing a risk to ecological receptors. Additional contaminants, including, TCE, 1,2-DCA, and nickel, were identified in groundwater during the RI. An interim remedial groundwater action is in place at SS030. The SS030 on-base interceptor trench was

started in July 1998. Six off-base extraction wells were started in September 1998, and a seventh well was started in September 2000 (CH2M HILL, 2001).

3.3.13 ST032 (Areas of Monitoring Wells MW107x32 and MW246x32)

ST032 encompasses the areas around MW107x32 and MW246x32 in the central part of the EIOU. Soil contamination found during the RI includes VOCs, PAHs, pesticides, PCBs, and metals. No COPECs were identified at ST032.

COCs found in the groundwater during the RI include benzene, TCE, 1,1-DCE, xylenes, and bis(2-ethylhexyl)phthalate. Floating product identified as TPH also was found in the groundwater at the site. Passive skimmers were used to collect petroleum from the surface of the groundwater until 2004. No additional groundwater action is planned at this time (CH2M HILL, 2001).

3.3.14 SD033 (Storm Sewer II, South Gate Area, Facilities 810 and 1917, and West Branch of Union Creek)

SD033 includes the west branch of Union Creek, parts of Storm Sewer II (SS II) (previously called Storm Sewer System B), Facilities 810 and 1917, the area around the South Gate, and Outfall II. These facilities are included as one site because past activities at any of these locations have been identified as a possible contaminant source for SS II.

SS II comprises underground piping and the West Branch of Union Creek and collects runoff from within the WIOU and small portions of the EIOU and WABOU. Runoff from SS II enters Union Creek south of the WIOU at Outfall II.

Facility 810 is used for aircraft-refurbishing activities. An OWS, sump, and wash rack that used to be located at the facility and discharge to SS II have been abandoned; the facility no longer discharges to the storm sewer. Wastes generated at the facility in the past have included PD-680, paints, solvents, lubricants, PCBs, and fuels.

Facility 1917 was used as an aircraft washdown area (Radian, 1996a). An OWS and wastewater collection sumps previously used during washdown activities remain at the facility but are no longer in use. Wastes generated at the facility during past activities include PD-680, soaps, engine oil, hydraulic fluid, and jet fuel.

Contaminants detected in sediment samples during the WIOU RI that may pose a potential ecological risk include carbon disulfide, benzo(a)anthracene, and nickel. Surface soil COPECs identified in the WIOU RI include lead, mercury, and zinc. Surface water COPECs identified in the WIOU RI were barium (dissolved), copper (total), and lead. No COCs have been identified in groundwater.

3.3.15 SD034 (Facility 811)

SD034 encompasses Facility 811 in the northern portion of the WIOU on Ragsdale Street, south of Hangar Avenue. Approximately 75% of the area is covered with roadbase and asphalt. Facility 811 includes an indoor wash rack that is used to wash aircraft. Wastewater from the wash rack flows into an OWS. Flow from the OWS can be directed into either the sanitary sewer

or a concrete-lined overflow pond just west of the facility. A hole was discovered in the OWS during 1994; the OWS has since been removed and replaced.

COCs detected in the soil during the RI include TPH. COCs in groundwater include VOCs, such as TCE and cis-1,2-DCE. An interim remedial groundwater extraction system has been in operation since February 2000, when the West Treatment and Transfer Plant (WTTP) was brought on line.

3.3.16 SS035 (Facility 818/819)

SS035 contains Facilities 818 and 819 and includes a wash area, an OWS and sump, a hydraulic-lift storage area, and a hazardous materials accumulation area. Asphalt and roadbase cover most of this site, though there is some exposed soil and grass along the eastern end of Facility 818.

COCs in the site soil identified in the WIOU RI include PCBs. The metals molybdenum, silver, and vanadium were identified as COPECs in soil. Other COCs were TCE and TPH-gasoline in the groundwater. A contaminant source could not be determined for the PCBs.

3.3.17 SD036 (Facility 872/873/876)

SD036, in the southeastern end of the WIOU, includes Facilities 872, 873, and 876. The site, while mostly paved, is surrounded by buildings and is situated in an active area of the Base. These facilities were constructed in 1953 as multiple-use shops; they have included a wash rack and an OWS. Current uses of the facilities include paint shops, electrical shops, landscape maintenance, paint mixing, and paint accumulation. The West Branch of Union Creek borders the eastern side of the site.

Contamination in the soil detected during the RI includes TPH. Groundwater COCs include VOCs (such as TCE, vinyl chloride, and TPH). An interim remedial groundwater extraction system has been in operation since February 2000, when the WTTP was brought on line.

3.3.18 SD037 (Sanitary Sewer System, Facilities 837/838, 919, 977, 981, Ragsdale/V Area, and Area G Ramp in the WIOU)

SD037 encompasses a large portion of the sanitary sewer system, Facilities 837/838, 919, 977, and 981, the Ragsdale/V area, and the Area G Ramp in the WIOU. Operations at the facilities have included an OWS, sumps, wash racks, and a fuel-hydrant system.

COCs found in the subsurface soils include TPH and SVOCs. Metals and PAHs were identified at isolated locations in the surface soil. COPECs identified as posing a potential risk to ecological receptors include copper, lead, mercury, molybdenum, zinc, and cadmium. The primary contaminant in the groundwater is TCE. Other contaminants in groundwater include petroleum hydrocarbons, PAHs, and other chlorinated hydrocarbons. An interim remedial groundwater extraction system has been in operation since February 2000, when the WTTP was brought on line.

3.4 Description of RI No Further Action Sites

This section provides a description and history for NEWIOU sites investigated in the RI phase and for which a determination of NFA (No Further Action) was made at the conclusion of each of the three RIs. It also identifies the potential contaminants investigated, the investigation results, and the rationale for the NFA determination.

3.4.1 NFA Sites Determined in the NOU RI

3.4.1.1 Former Skeet Range

A 1953 Civil Engineering drawing of the base showed a skeet range located in the southern portion of Landfill 2. The potential contaminant was lead from lead shot. Surface soil samples were taken in the area. Evaluation of the data showed that the area was not a source area of inorganic constituents (including lead) and that levels of inorganics in the soil were consistent with background. The RI recommended no further action on the skeet range as an individual Area of Concern (AOC). The former skeet range and two other AOCs were combined and designated LF007 after the RI. The NFA determination is documented in the Final NOU RI (Radian, 1995).

3.4.1.2 Landfill 1 (LF006)

Landfill 1 was a burn-and-fill landfill operated from 1943 to 1950 that covered approximately 17 acres in the western portion of the NOU. Materials disposed of and burned consisted primarily of general refuse, such as wood, glass and construction debris, although some disposal of industrial wastes was reported. The potential contaminants were VOCs, SVOCs, metals, PCBs, pesticides, dioxins, and petroleum hydrocarbons. Groundwater, soil gas, surface flux, surface water, sediment, surface soil, and subsurface soil samples were taken in the area. The NOU RI evaluated the data and performed a risk assessment. The RI concluded that the soil at Landfill 1 did not indicate an unacceptable risk and recommended no further action. The RI recommended that the groundwater at Landfill 1 be evaluated further in the FS due to TCE concentrations. Landfill 1 was designated as LF006 after the RI and addressed in the NEWIOU FS, Proposed Plan, and Groundwater IROD as a groundwater-only site. The NFA determination for soil is documented in the Final NOU RI (Radian, 1995).

3.4.2 NFA Sites Determined in the EIOU RI

3.4.2.1 Grid 216 I Site

Grid 216 I refers to a specific area, within the base map grid system, that is located on the southern side of the runway, where a C-124 plane crash was reported to have occurred in 1956. The site is covered with grass. An aerial photograph review did not reveal any staining or any other evidence of a crash. The primary concern at the site was the potential for petroleum-related contamination caused by the plane crash. A 500-foot long area along the runway was investigated.

Groundwater samples were taken in the area, and the only detection was TCE at 1.1 micrograms per liter (µg/L). The site investigation concluded that there are no contaminants associated with the plane crash location, and that the low level of TCE is associated with the nearby

MW-329 site (ERP Site SS029); an NFA was recommended. The NFA determination is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.2 Facility 336

Facility 336 was a pesticide shop that was constructed in 1951 and demolished in 1990. The potential contaminants were VOCs, SVOCs, and petroleum hydrocarbons. Data were collected from surface soil and subsurface soil. The RI determined that concentrations of pesticides detected in the soil at Facility 336 were similar to concentrations detected at other EIOU sites and were considered to be the result of agricultural use prior to the establishment of Travis AFB. The levels of contaminants did not indicate an unacceptable risk, and NFA was recommended. The NFA determination is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.3 Facility 1185

Facility 1185 was constructed in 1963 and contains the radar and weather antenna facility. A small fuel spill was reported to have occurred inside the building. The potential contaminants were VOCs, pesticides, metals, and petroleum hydrocarbons. Data were collected from surface soil and subsurface soil. TPH was detected in surface and subsurface soil samples, with a maximum of 120 milligrams per kilogram (mg/kg). Pesticide concentrations detected in the soil were similar to concentrations detected at other EIOU sites and considered to be the result of agricultural use, prior to the establishment of Travis AFB, or from adjacent agricultural property. The RI determined that the low concentrations of TPH detected in surface soil resulted from surface runoff from the road and parking lot. The levels of contaminants did not indicate an unacceptable risk, and NFA was recommended. The NFA determination is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.4 Facility 1201

Facility 1201 contains the flight kitchen, aircraft toilet maintenance shop, and flight service shop. The potential contaminants were VOCs, SVOCs, metals, and petroleum hydrocarbons. Data were collected from surface soil and subsurface soil. TPH was detected at all surface soil and soil boring locations at Facility 1201, but no source of contaminants was identified at the site.

The RI concluded that the contamination was associated with the nearby Facility 363, which is a fuel storage area with aboveground and underground tanks. The RI stated that the TPH at the site is likely the result of leaking tanks. Facility 363 has become ERP site ST028 and is being addressed as a non-CERCLA site under the ERP POCOS program. The NFA determination for Facility 1201 is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.5 Facility 206

Facility 206 was constructed in 1973 as the Aeromedical Evacuation Training area. Contamination at Facility 206 is associated with two USTs located at the facility. The potential contaminants were VOCs, metals, and petroleum hydrocarbons. Data were collected from surface soil and subsurface soil. The maximum TPH concentration detected in the soil was 72 mg/kg, which was below guidance values. VOCs detected in soil were common laboratory contaminants and were not detected in underlying groundwater. The levels of contaminants did not indicate an

unacceptable risk, and NFA was recommended. The NFA determination is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.6 Facility 226

Facility 226 was the auto/photography hobby shop constructed in 1966. A visual site inspection in 1992 indicated evidence of leakage from the waste oil tank, as observed in a stained area. A waste oil trench collection system and associated UST were removed from the site during the UST removal program in 1994. The potential contaminants were VOCs, metals, and petroleum hydrocarbons. Data were collected from surface soil and subsurface soil. The maximum TPH concentration detected in the soil was 62 mg/kg, which was below guidance values. VOCs detected in soil were common laboratory contaminants and were not detected in underlying groundwater. The levels of contaminants did not indicate an unacceptable risk, and NFA was recommended. The NFA determination is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.7 Facility 381

Facility 381 is the Old Base Hospital. No source area has been identified at the site, although fixer and developer were disposed of at the sanitary sewer at the site. Thirty soil gas samples were collected from the site in 1993 and did not reveal any detection of organics. The RI recommended NFA for this area because the soil gas survey did not detect contaminants in the soil. The NFA determination is documented in the Final EIOU RI (Weston, 1995a).

3.4.2.8 Facility 1205 (SD031)

Building 1205 is a diesel generator maintenance and repair facility located in the northeastern part of the EIOU. It was constructed in 1957 and includes a wash rack and OWS. The facility has handled oils, antifreeze, and solvents since 1957. The potential contaminants were VOCs, SVOCs, pesticides, PCBs, petroleum hydrocarbons, and metals. Groundwater, surface soil, and subsurface soil samples were taken in the area.

The EIOU RI evaluated the data and performed a risk assessment. The RI determined that groundwater contamination (primarily TCE) was a potential human health risk and recommended further evaluation in the FS. The detected concentrations indicated that dense nonaqueous phase liquid (DNAPL) may be present in the area. Facility 1205 was designated SD031 in the RI and has been addressed in the NEWIOU FS, Proposed Plan, and Groundwater IROD as a groundwater site (including any potential DNAPL). The RI concluded that the levels of contaminants in the soil at Facility 1205 did not indicate an unacceptable risk, and NFA was recommended. NFA for the soil (vadose zone) portion of SD031 is documented in the Final EIOU RI (Weston, 1995a).

3.4.3 NFA Sites Determined in the WIOU RI

3.4.3.1 Facility 835

Facility 835 is located east of Ragsdale Street in the central portion of the WIOU. The building was constructed in 1954 as an aircraft maintenance shop and is currently used as an office building. A sump east of the facility and a transformer on the western side of the facility were investigated as areas where contamination may have been released to the environment. The

potential contaminants for the sump were VOCs, SVOCs, and petroleum hydrocarbons. The potential contaminant for the transformer pad was PCBs.

Data collected from soil borings, a surface scrape, soil gas samples, and HydroPunch® groundwater samples were of sufficient quantity and quality to determine that no contaminants were released from the sump and transformer at Facility 835, and NFA was recommended. The NFA determination is documented in the Final WIOU RI (Radian, 1996a).

3.4.3.2 Facility 839

Facility 839 is an aircraft hangar located east of Ragsdale Street. It was constructed in 1958 to house TF33 engine inspection, cleaning, and maintenance operations. During these activities, the engines were hung on racks above drip pans, which contain small leaks and spills of oils and solvents. Facility 839 also houses a large degreasing tank. The potential contaminants were VOCs, SVOCs, petroleum hydrocarbons, and metals.

Data collected from soil, soil gas, and groundwater samples were of sufficient quantity and quality to determine that the waste accumulation area at Facility 839 was not a source of contaminants, and NFA was recommended. The NFA determination is documented in the Final WIOU RI (Radian, 1996a).

3.4.3.3 Facility 842

Facility 842 is located east of Ragsdale Street and was constructed as an aircraft hangar in 1958; it is now used as a parts warehouse. A hazardous waste accumulation point that previously serviced several nearby facilities was located east of Facility 842 on the flightline apron. The area was used to store reclaimed jet fuel, hydraulic fluid, batteries, and used engine oil in 55-gallon drums. The potential contaminants were petroleum hydrocarbons, VOCs, SVOCs, and metals.

Data collected from soil, soil gas, and groundwater samples were of sufficient quantity and quality to determine that the waste accumulation area at Facility 842 was not a source of contaminants. The NFA determination is documented in the Final WIOU RI (Radian, 1996a).

3.4.3.4 Facility 871

Facility 871 is located southwest of the Ragsdale Street and V Street intersection. Facility 871 was constructed in 1953 to serve as a civil engineering storage and waste accumulation area for Facilities 872, 873, 874, and 878. From 1965 to 1983, the facility was used to store and mix pesticides, and it has recently been used to store oil and distillate materials used at Facility 872. There is also a hazardous waste accumulation area on the southern side of the facility and a drum storage area approximately 75 feet east of the facility. The potential contaminants were VOCs, SVOCs, metals, PCBs, pesticides, and petroleum hydrocarbons.

Data collected from soil, soil gas, and groundwater samples were of sufficient quantity and quality to determine that the drum storage area and the former pesticide storage area at Facility 871 were not sources of contamination. TCE, tetrachloroethene (PCE), and TPH in groundwater are attributed to a source at Facility 872, which is part of ERP Site SD036. The NFA determination is documented in the Final WIOU RI (Radian, 1996a).

PART II

4.0 NEWIOU Feasibility Study Summary

Travis AFB conducted an FS for the sites within the NEWIOU to assist in selecting RAs for the contaminated soil, sediment, and surface water (Radian, 1996b). The primary objectives of the FS were to:

- Identify potential response actions, technologies, and process options to address the potential risks in the NEWIOU;
- Screen the technologies and process options;
- Assemble feasible and appropriate remedial alternatives;
- Provide detailed evaluations of the remedial alternatives; and
- Perform a comparative analysis of the alternatives.

The FS was divided into three main phases:

- The Initial Screening of Alternatives;
- The Detailed Analysis of Alternatives; and
- The Comparative Analysis of Alternatives.

The discussion of the FS in this section of the ROD is from a historical perspective. As discussed in Section 2.2.3, after the NEWIOU SSSW Proposed Plan was completed, there was a four-year delay while the WABOU Soil ROD was completed. Work then began on the NEWIOU SSSW ROD using the approach that proved successful for the WABOU Soil ROD. One of the changes was the use of PRGs as the basis for soil cleanup levels for human health, as discussed in Section 5.2.3, unless a lower or higher level was justified. In addition, due to delay and the complexity of dealing with 18 sites, 40 COCs, 3 media (soil, sediment, and surface water), and 3 types of receptors (human, ecological, and groundwater) in one document, it was decided to use tech memos as ROD development documents. The three tech memos (Human Health Tech Memo, Eco Tech Memo, and Groundwater Protection Tech Memo) provided site-by-site summaries and maps with RI data and any updated site information. The Eco Tech Memo provided an extensive update of the ERA. After extensive discussion between the Air Force and the regulatory agencies, selected remedial alternatives were included in each tech memo for each site, with supporting rationale. The information from the three tech memos was summarized and consolidated in this ROD. The intent was to have this ROD provide the decisions on remedial actions and how they were developed, yet still be concise (approximately 1 inch thick). The details of the ROD development are available in the tech memos (totaling approximately 5 inches thick) if needed. Sections 5.2.3, 5.2.4, and 5.2.5 discuss each of the tech memos in more detail.

The tech memos built upon the NOU, EIOU, and WIOU RIs, the NEWIOU FS, and the NEWIOU SSSW Proposed Plan, but at some sites the remedial alternative selected in this ROD differed from the NEWIOU SSSW Proposed Plan. All remedial alternatives selected in this ROD

were included and discussed in the NEWIOU SSSW Proposed Plan. The Responsiveness Summary (Part III) of this ROD documents the presentation of the differences between the NEWIOU SSSW Proposed Plan and this ROD to the public and their response.

4.1 Initial Screening of Alternatives

The purpose of the Initial Screening of Alternatives (ISA) is to develop an appropriate range of remedial alternatives that would protect human health and the environment at the 18 sites identified in the RIs. This is necessary because of the large number of remedial technologies available to handle a wide variety of contaminants under various site conditions.

With all of the combinations of remedial options available, the evaluation process could easily become too complicated and cumbersome. To prevent this, during the ISA those technologies that were not appropriate for the contaminants and site conditions found in the NEWIOU were screened out. The remaining technologies were used to develop the most promising remedial alternatives.

The alternatives screening process consists of the following seven steps.

Step 1: Establish Remedial Action Objectives. Remedial action objectives (RAOs) specify the extent of cleanup required to protect human health and the environment. The RAO for a site takes into account the contaminant that poses the potential risk, the exposure routes and receptors, and an acceptable contaminant level or range of levels for each exposure route.

Step 2: Develop General Response Actions. General response actions describe the broad range of actions that will satisfy the RAOs.

Step 3: Identify Potential Remedial Technologies and Process Options. Many potentially applicable technology types are available to remediate all categories of contaminants under various site conditions. Some technologies have a proven record of performance; others are promising but have not been tested under all field conditions. General technology types that can be used to implement a general response action are referred to as remedial technologies. Specific technology types within a remedial technology are called process options. An example of a remedial technology for an administrative action is access restrictions; an example of a process option within this remedial technology is fencing. Information on remedial technologies and process options is acquired through database searches and technical journal reviews. This review of all potentially applicable technologies ensures that the best technologies are not overlooked early in the FS process.

Step 4: Screen Process Options for Technical Implementability. In this step, the list of technology and process options is reduced by evaluating the technical implementability of the options. Technical implementability refers to the ability of the remedial technology or process option to meet an RAO. The result of this step is a list of technologies and process options that are capable of addressing contaminant types found in the NEWIOU under existing site conditions.

Step 5: Evaluate Technology and Select Representative Process Options. The process options that survived the Step 4 screening are evaluated for administrative implementability, effective-

ness, and cost. Examples of administrative implementability are the ability to obtain the necessary permits and the availability of necessary equipment and workers to implement the process option. This evaluation further reduces the list of process options to those that can be implemented, that are effective in treating the contaminants in the NEWIOU, and that are not cost-prohibitive.

Even after the above evaluations are completed, a number of process options could be implemented to meet the RAOs. From the list of remaining process options within each remedial technology, a representative process option is selected. The representative process option is used to develop the alternatives, but the other equally promising process options are retained.

Step 6: Assemble Remedial Alternatives. The representative process options are used to assemble remedial alternatives that represent a range of general response actions specifically for the NEWIOU sites.

Step 7: Screen Remedial Alternatives. In this final step of the ISA, the remedial alternatives are again screened to ensure they meet three criteria: protectiveness of human health and the environment, implementability, and cost-effectiveness.

The six alternatives identified in the ISA that are applicable to the two NEWIOU sites with surface water contamination (i.e., SD001 and SD033) were:

- Alternative #10: No Action;
- Alternative #11: Institutional Actions;
- Alternative #12: Collection Sump, Ion Exchange, Activated Carbon, Discharge to Union Creek;
- Alternative #13: Collection Sump, Activated Carbon, Discharge to Union Creek;
- Alternative #14: Slip-Lining and Collaring Storm Sewer System; and
- Alternative #15: Source Control.

The seven alternatives identified in the ISA that are applicable to the NEWIOU sites with soil and/or sediment contamination were:

- Alternative #16: No Action;
- Alternative #17: Institutional Actions (Land Use Controls, Access Restrictions)/Natural Attenuation
- Alternative #18: Backhoe, Disposal at Existing Off-Site Landfill;
- Alternative #19: Soil and Bentonite Cap;
- Alternative #20: Backhoe, Ex Situ High Temperature Thermal Treatment, Disposal at Existing Off-Site Landfill;

- Alternative #21: In Situ Soil Vapor Extraction (SVE), Off Gas Catalytic Oxidation; and
- Alternative #22: In Situ Bioventing.

Alternatives #1 through #9 identified options to address groundwater contamination at the NEWIOU sites. These alternatives are not shown here because this ROD does not address groundwater contamination.

4.2 Detailed Analysis of Alternatives

The purpose of the Detailed Analysis of Alternatives (DAA) is to analyze the alternatives identified in the ISA and present the relevant information needed to select the appropriate remedies. This is accomplished by evaluating each alternative against the nine criteria provided under CERCLA. Table II-4-1 identifies and defines the nine evaluation criteria used in the FS. The Community Acceptance and State Acceptance criteria are addressed in this NEWIOU SSSW ROD on the basis of acceptance of the NEWIOU SSSW Proposed Plan and the evaluation of comments received during the 8 July 1998 to 8 August 1998 public comment period.

The 13 alternatives selected in the ISA were next evaluated according to criteria specified in CERCLA. Conducting such an evaluation is difficult at an area as large and complex as the NEWIOU. Analyzing 20 sites by 22 alternatives (including groundwater sites and alternatives) would result in over 200 detailed analyses, which would be both repetitive and obtuse. Consequently, the FS took two steps to reduce this complexity. First, the 20 sites were combined into 18 groups (9 groundwater, 8 soil/sediment, 1 surface water). The groups were formed on the basis of each site's location, contaminant type, and environmental medium—so, a site with both soil and groundwater contamination could be placed in two groups. Second, a representative site was then chosen from each group. This representative site was then ranked according to the CERCLA criteria. This approach eliminated repetition without compromising the conclusions of the DAA.

The key elements and results of the FS have been summarized in a series of tables and figures:

- The 18 sites, their names, and the media impacted (Table II-4-2); and
- The 18 site groupings (Groups J through R) and the rationale for each group (Table II-4-3).

Although site groupings were useful in the FS, the NEWIOU SSSW Proposed Plan and this ROD evaluate sites individually.

4.3 Comparative Analysis of Alternatives

In the final phase of the FS, the soil and sediment remediation alternatives are evaluated in accordance with the requirements of each CERCLA criterion. This evaluation identifies the relative strengths and weaknesses of each alternative to determine the preferred alternatives at each site. Each remedial alternative was evaluated against the criteria specified in CERCLA (as summarized on Table II-4-1). The criteria attempt to answer such questions as: How effective is the alternative? Is it easily implemented? What is the probable cost? Will it be in compliance with all applicable regulations? Each remedial alternative was given a rating of 0, 3, or 5 (0 does

Table II-4-1
Remedial Alternative Evaluation Criteria
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Criterion Type	Evaluation Criterion	Definition
Threshold Factors	Protective of human health and the environment[a]	Protects human health and the environment through the elimination, reduction, or control of contaminated media. All migration pathways must be addressed.
	Compliance with appropriate ARARs[a]	Addresses whether a remedy will meet all ARARs (federal and state environmental requirements) and/or provide grounds for invoking a waiver.
Balancing Factors	Long-term effectiveness and permanence[a]	Protects human health and the environment after the remedial objectives have been met.
	Reduction in toxicity, mobility, and volume through treatment[a]	Treats the media and reduces the toxicity, mobility, and/or volume of the contaminated media.
	Short-term effectiveness[a]	Protects human health and the environment during construction and implementation. The degree of threat and the time period to achieve remedial action objectives also are considered.
	Implementability	There are no administrative barriers (no permits, zoning limitations). The availability of materials and personnel, site features, such as available space and topography, and impacts on ongoing operations are considered. The technical status of alternatives also is considered; theoretical technologies with only limited bench-scale evaluation are considered less implementable than fully proven processes.
	Cost	Costs include design, construction, startup, monitoring, and maintenance. Accuracy is to within -30% and +50%.
Modifying Considerations	State acceptance	The state's (or other regulatory agency's) preference among or concern about alternatives.
	Community acceptance	The community's apparent preferences among or concerns about alternatives.

[a] Effectiveness criterion used to determine the benefit/cost ratio.

ARARs = applicable or relevant and appropriate requirements
NEWIOU = North/East/West Industrial Operable Unit
ROD = record of decision

not meet the criterion, 3 partially meets the criterion, 5 completely meets the criterion). For example, take the CERCLA criterion "Reduction in Toxicity, Mobility, and Volume Through Treatment." An alternative would be rated 5 if it eliminated the problem, 3 if it only reduced the problem, and 0 if it would have no effect.

One criterion, cost, is different from the other six CERCLA criteria (included under Threshold Factors and Balancing Factors) evaluated during the FS. Alone, these other criteria cannot determine the "best" alternative. Cost adds an important quantitative element because funding is often a limiting factor in selecting an alternative. As such, cost was evaluated differently,

Table II-4-2
NEWIOU Soil, Sediment, and Surface Water Sites
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Site ERP Designation	Site Name	Operable Unit	Affected Media
SD001	Union Creek	EIOU	Soil*, Surface Water
FT002	FTA-1	EIOU	Soil
FT003	FTA-2	EIOU	Soil
FT004	FTA-3	EIOU	Soil, Groundwater
FT005	FTA-4	EIOU	Soil, Groundwater
LF007	Landfill 2	NOU	Soil, Groundwater
OT010	Sludge Disposal Site	EIOU	Soil
SS015	Solvent Spill Area and Facilities 808, 1832, and 552	EIOU	Soil, Groundwater
SS016	Oil Spill Area Facilities 11, 13/14, 20, 42/1941, 139/144, and Sewer System Right-of-Way	EIOU	Soil, Groundwater
WP017	Oxidation Pond Site	EIOU	Soil
SS029	MW329x29 Area	EIOU	Soil, Groundwater
SS030	MW269x30 Area	EIOU	Soil, Groundwater
ST032	MW246x32/MW107x32 Areas	EIOU	Soil, Groundwater
SD033	Storm Sewer II, South Gate Area, Facilities 810 and 1917, and West Branch of Union Creek		Soil*, Surface Water, Groundwater
SD034	Facility 811	WIOU	Soil, Groundwater
SS035	Facility 818/819	WIOU	Soil, Groundwater
SD036	Facility 872/873/876	WIOU	Soil, Groundwater
SD037	Sanitary Sewer System, Facilities 837/838, 919, 977, 981, Ragsdale/V Area, and Area G Ramp	WIOU	Soil, Groundwater

* Soil includes sediment.

EIOU = East Industrial Operable Unit
ERP = Environmental Restoration Program
FTA = Fire Training Area
NEWIOU = North/East/West Industrial Operable Unit
NOU = North Operable Unit
ROD = record of decision
WIOU = West Industrial Operable Unit

using ratings of 5, 3, 1, and -1. Remedial alternatives with costs ranging from less than $1.5 million were awarded a score of 5, and costs over $10 million were awarded a score of -1.

Once all of the alternatives were scored (or rated) for each of the seven criteria, two methods were used to compare the results. One method was to compare the "Total Score" (or the sum of ratings awarded for each of the seven CERCLA criteria) of each remedial alternative. The other method is the "Benefit/Cost Ratio," in which the sum of the scores for the first five criteria (i.e., the seven criteria under Threshold Factors and Balancing Factors, excluding implementability and cost) is divided by the estimated cost of the alternative in millions of dollars. Hence, an alternative costing $6.4 million dollars can have a total score of 29, and a benefit/cost ratio of

Table II-4-3
Site Groupings
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Media	Group	Sites[a]	Rationale for Grouping
Surface water	J	**SD033**, SD001	• Both surface water sites impact Union Creek. • Surface water COCs (TCE, TPH, and metals) are similar for both sites. • Groundwater source control or downstream treatment could be used for both sites.
Soil	K	**FT003**, FT002, FT004, FT005	• Similar COCs (PCBs, PAHs, and dioxins/furans). • Includes all former fire-training areas in the NEWIOU.
Soil	L	**LF007**	• Geographically isolated location in northeastern corner of Travis AFB. • Subject to remediation to mitigate ecological risk. • COCs (PCBs, PAHs, and metals) derived from landfill operations. • Unique heterogeneous nature of subsurface soil.
Soil	M	**WP017**, OT010, SS029, SS030	• Sites located close together southeast of the runway. • Similar COCs (PAHs and metals). • Soil volumes are similar for both sites.
Soil	N	**SS035**, SS015, SS016	• Similar COCs (PAHs). • Sites located close to each other near center of Travis AFB.
Soil	O	**SD036**	• Soil gas COCs (TPH, chlorinated organics) are a primary concern. • Major soil contaminant is TPH.
Soil	P	**SD037**, SD033	• Much of contamination is associated with storm and sanitary sewers. • Contains isolated pockets of soil gas (contaminated with TPH, benzene, and TCE). • Site contains PAHs in surface soils and TPH and SVOCs in subsurface soils.
Soil	Q	**SD034**, ST032	• Free product above water table. • Major soil contaminant is TPH. • Soil gas contaminated with TPH and TCE.
Soil[b]	R	**SD001**, SD033	• Sediments associated with surface water are media of concern, rather than soils. • Similar COCs (metals and PAHs).

[a] The representative site for each group is listed first and bolded.
[b] Soil includes sediment.

COC = contaminant of concern
NEWIOU = North/East/West Industrial Operable Unit
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyls
ROD = record of decision
SVOC = semivolatile organic compound
TCE = trichloroethene
TPH = total petroleum hydrocarbons

3.9 (the sum of the first five criteria is 25; 25 divided by 6.4 equals 3.9). In effect, the total score measures overall compliance with the CERCLA criteria. The benefit/cost ratio (also termed "cost effectiveness") better quantifies the degree to which the criteria are satisfied per unit cost expenditure. "Effectiveness" is the sum of the first five criteria. It should also be noted that this analysis was performed several years ago in the FS and would not be identical to an analysis performed in an FS today.

Employing the methods described above, Figures II-4-1 and II-4-2 summarize the alternatives receiving the highest scores and ratios for surface water and for soil (and sediment, if present), respectively. It should be noted that the highest ranking (score) does not necessarily result in the "best" alternative, considering the assumptions used in the analysis.

The NEWIOU FS only evaluated the feasible remedial alternatives for each group. It stopped short of identifying the preferred alternative, which was the responsibility of the Proposed Plan and ROD. The selected remedial alternatives for each site are described in Section 5.0. The following subsections provide discussions of how alternatives were determined to meet CERCLA criteria in the FS analysis.

4.3.1 Summary of the Surface Water Group

For the surface water group (Group J), Alternative 15 (Source Control) had the highest total score, and Alternative 14 (Slip-Lining and Collaring Storm Sewer System) was the most cost effective. Travis AFB has implemented source control (using groundwater extraction and treatment) as part of the WABOU and NEWIOU Groundwater IRODs to control migration of contaminated groundwater to Union Creek. Recent sampling has shown that extraction of groundwater has reduced the levels of TCE in the creek to levels that do not pose a risk to human health or the environment.

Table II-4-4 contains the total scores, present worth costs, and benefit/cost ratios for each surface water alternative. The NEWIOU FS presents the detail on how these scores, costs, and ratios were calculated. As previously indicated, Figure II-4-1 shows a bar chart comparing the surface water alternatives' total scores and benefit/cost ratios.

4.3.2 Summary of the Soil Groups

For all soil groups, except Group O, Alternative 20 (Excavation and Off-Site Thermal Treatment and Disposal) was rated the most effective. For Group O, Alternatives 21 (SVE and Catalytic Oxidation Treatment) and 22 (Bioventing) were rated equally effective. Among the seven groups for which Alternative 20 was the most effective, cost-effectiveness was again a distinguishing factor. For Groups K, L, M, N, O, P, and Q, Alternative 17 (Institutional Actions) was rated the most cost effective. For Group R, Alternative 18 (Excavation, Removal to Landfill) was rated the most cost effective.

Tables II-4-5, II-4-6, and II-4-7 contain a summary of the results of the evaluations for soil groups. The NEWIOU FS presents the detail on how these scores, costs, and ratios were calculated. As previously indicated, Figure II-4-2 shows the soil alternatives' total scores and benefit/cost ratios.

Figure II-4-1.
Alternatives for Surface Water Group J

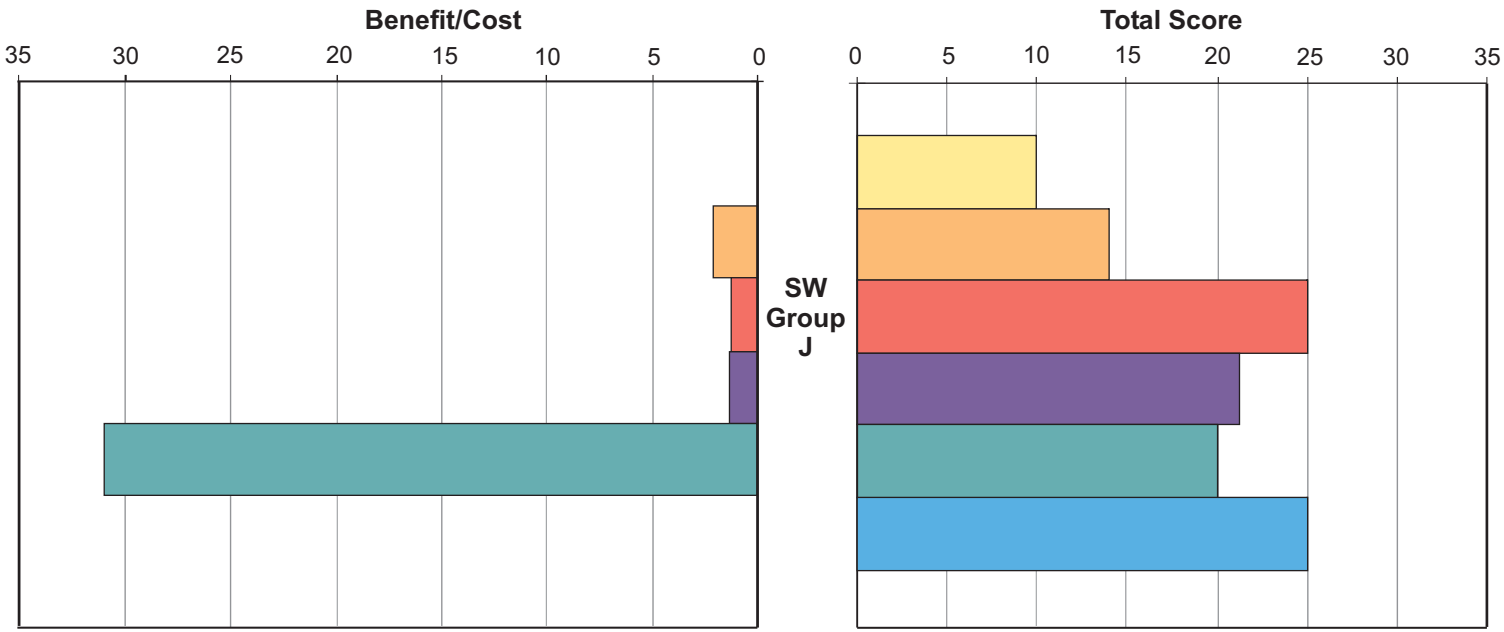

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Figure II-4-2. Alternatives for Soil Groups (K, L, M, N, O, P, Q and R)

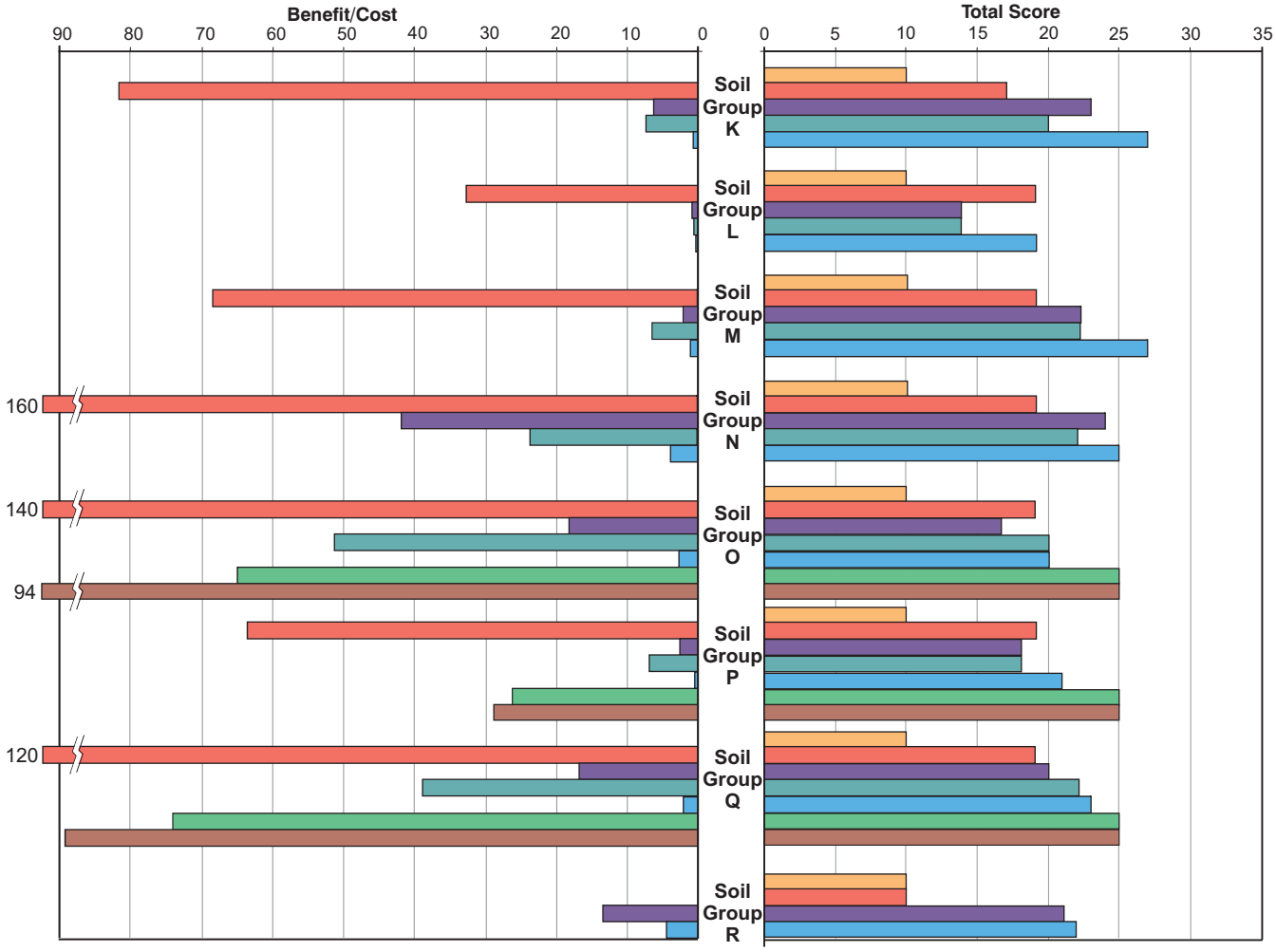

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Table II-4-4
Summary of Total Scores, Present Worth Costs, and Benefit/Cost Ratios for Surface Water
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Alternative	Total Score	Cost	Benefit/Cost Ratio
Alternative #10	10	$0	NA
Alternative #11	14	$2.6M	2.3
Alternative #12	25	$14M	1.5
Alternative #13	21	$9.1M	1.6
Alternative #14	20	$0.39M	31
Alternative #15	25	$0	NA

Alternative #10: No Action
Alternative #11: Institutional Actions (Access Restrictions, Monitoring, Natural Attenuation)
Alternative #12: Collection Sump, Ion Exchange, Activated Carbon, Discharge to Union Creek
Alternative #13: Collection Sump, Activated Carbon, Discharge to Union Creek
Alternative #14: Slip-Lining and Collaring Storm Sewer
Alternative #15: Source Control

NA = not applicable
NEWIOU = North/East/West Industrial Operable Unit
ROD = record of decision

Note: The estimated present worth cost is in millions (M) of dollars.

Table II-4-5 summarizes the evaluation of alternatives for soil groups K through R. Table II-4-6 shows the alternatives' total scores and benefit/cost ratios for soil, and Table II-4-7 shows the alternatives' total present worth costs for soil. The highest total scores are generally associated with alternatives that treat contaminants and provide protection from exposure. Alternative 20 has the highest total score for Groups K, L, M, N, and R. For Groups O, P, and Q, Alternatives 21 and 22 have the highest total score. As previously indicated, Figure II-4-2 shows a bar chart comparing alternatives' total scores and benefit/cost ratios for each group.

Table II-4-5
Soil Groups Evaluation Summary
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Group	Most Cost Effective[a]	Highest Benefit[b]
K	Alternative 17 (82)	Alternative 20 (27)
L	Alternative 17 (33)	Alternative 20 (19)
M	Alternative 17 (69)	Alternative 20 (27)
N	Alternative 17 (160)	Alternative 20 (25)
O	Alternative 17 (140)	Alternative 20 (25)
P	Alternative 17 (64)	Alternatives 21 and 22 (25)
Q	Alternative 17 (120)	Alternatives 21 and 22 (25)
R	Alternative 17 (43)	Alternatives 21 and 22 (22)

[a] Highest benefit/cost ratio is shown in parenthesis.
[b] Highest total of effectiveness criteria score is shown in parenthesis.

Alternative #16: No Action
Alternative #17: Institutional Actions (Access Restrictions, Monitoring, Natural Attenuation)
Alternative #18: Backhoe, Disposal at Existing Off-Site Landfill
Alternative #19: Soil and Bentonite Cap
Alternative #20: Backhoe, Ex Situ High Temperature Thermal Treatment, Disposal at Existing Off-Site Landfill
Alternative #21: In Situ Soil Vapor Extraction (SVE), Off-Gas Catalytic Oxidation
Alternative #22: In Situ Bioventing

NEWIOU = North/East/West Industrial Operable Unit ROD = record of decision

Table II-4-6
Summary of Total Scores and Benefit/Cost Ratios for Soil[a]
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Group	Alternative #16	Alternative #17	Alternative #18	Alternative #19	Alternative #20	Alternative #21	Alternative #22
K	10 | 0	17 | 82	22 | 5.9	20 | 7.4	27 | 0.61	NA	NA
L	10 | 0	19 | 33	14 | 0.92	14 | 0.67	19 | 0.09	NA	NA
M	10 | 0	19 | 69	22 | 2.2	22 | 6.4	27 | 1.0	NA	NA
N	10 | 0	19 | 160	24 | 42	22 | 24	25 | 4.1	NA	NA
O	10 | 0	19 | 140	17 | 18	20 | 52	20 | 2.5	25 | 65	25 | 94
P	10 | 0	19 | 64	18 | 3.0	18 | 7.5	21 | 0.35	25 | 27	25 | 29
Q	10 | 0	19 | 120	20 | 17	22 | 39	23 | 2.1	25 | 74	25 | 89
R	10 | 0	10 | 0	21 | 13	NA	22 | 4.4	NA	NA

[a] These total scores and benefit/cost ratios were derived from analyses of how alternatives would address soil that poses a risk to human health and ecological receptors. Total scores are indicated on the left side of the column, and benefit/cost ratios are indicated on the right side.

Alternative #16: No Action
Alternative #17: Institutional Actions (Access Restrictions, Monitoring, Natural Attenuation)
Alternative #18: Backhoe, Disposal at Existing Off-Site Landfill
Alternative #19: Soil and Bentonite Cap
Alternative #20: Backhoe, Ex Situ High Temperature Thermal Treatment, Disposal at Existing Off-Site Landfill
Alternative #21: In Situ Soil Vapor Extraction (SVE), Off-Gas Catalytic Oxidation
Alternative #22: In Situ Bioventing

NA = not applicable
NEWIOU = North/East/West Industrial Operable Unit
ROD = record of decision

Table II-4-7
Summary of Total Present Worth Costs for Soil[a]
North/East/West Industrial Operable Unit Soil, Sediment, and Surface Water Record of Decision, Travis AFB, California

Group	Alternative #16	Alternative #17	Alternative #18	Alternative #19	Alternative #20	Alternative #21	Alternative #22
K	$0	$0.11M	$2.7M	$1.9M	$38M	NA	NA
L	$0	$0.27M	$13M	$18M	$190M	NA	NA
M	$0	$0.13M	$7.4M	$2.2M	$22M	NA	NA
N	$0	$0.057M	$0.38M	$0.58M	$5.1M	NA	NA
O	$0	$0.064M	$0.50M	$0.23M	$6.4M	$0.26M	$0.18M
P	$0	$0.14M	$4.0M	$1.6M	$55M	$0.63M	$0.58M
Q	$0	$0.073M	$0.71M	$0.31M	$9.1M	$0.23M	$0.19M
R	$0	$0.1M	$0.3M	NA	$3.6M	NA	NA

[a] Costs are in millions (M) of dollars.

Alternative #16: No Action
Alternative #17: Institutional Actions (Access Restrictions, Monitoring, Natural Attenuation)
Alternative #18: Backhoe, Disposal at Existing Off-Site Landfill
Alternative #19: Soil and Bentonite Cap
Alternative #20: Backhoe, Ex Situ High Temperature Thermal Treatment, Disposal at Existing Off-Site Landfill
Alternative #21: In Situ Soil Vapor Extraction (SVE), Off-Gas Catalytic Oxidation
Alternative #22: In Situ Bioventing

NA = not applicable
NEWIOU = North/East/West Industrial Operable Unit
ROD = record of decision

Because cost generally varies more than effectiveness scores, it is the most important factor in the ranking of benefit/cost scores between alternatives within groups. In most groups, the highest benefit/cost ratings are associated with alternatives that provide at least some protection from contaminants at relatively little cost. Alternative 20 has the highest present worth costs for all groups, while Alternative 17 consistently has the lowest present worth cost.

Some of the conclusions in the FS have been changed based on more recent data and risk evaluation. For example, Travis AFB has determined that Alternative 16 (No Action) meets threshold criteria for those soil sites for which this alternative was selected, and that Alternative 17 (Land Use Controls) complies with ARARs for those sites for which it is selected. The Air Force has determined that all the selected remedies meet the threshold criteria.

4.4 Corrective Action Management Unit (CAMU)

The CAMU is an important strategy at Travis AFB for the on-base consolidation of contaminated soil. It is proposed in this ROD that NEWIOU soils be consolidated in the CAMU. A CAMU is a designated area within a facility that is designed to carry out a corrective action, such as the management of contaminated soil. The state and federal CAMU regulations were written to give regulatory agencies greater flexibility in selecting and implementing the most effective and appropriate waste management strategy for the cleanup of large complex facilities, such as Travis AFB.

The final CAMU rules are found in 40 Code of Federal Regulations (CFR) 264.552. These regulations have been adopted under the California RCRA program and are found in Title 22, California Code of Regulations (CCR), Section 66264.552. The U.S. EPA proposed a new CAMU regulation at 65 Fed. Reg. 51080, 22 August 2000, that allowed a facility to use the existing CAMU regulations if a substantially complete CAMU proposal was submitted prior to 20 November 2000. This new CAMU regulation has been finalized at 67 Fed. Reg. 2961, 22 January 2002; 40 CFR 264.550(b) and has been incorporated into 22 CCR 66264.552. The California grandfathering provision is at 22 CCR 66264.550. The regulatory agencies concurred in the WABOU Soil ROD that Travis AFB met the substantive portion of the grandfathering provisions of these regulations prior to the deadline.

The CAMU allows for more flexibility when managing remediation wastes and leads to the expeditious implementation of protective and cost-effective remedies at CERCLA sites. Historically, hazardous waste regulations have discouraged digging up contaminated materials and properly managing them. Excavating contaminated materials triggered requirements, such as land disposal restriction (LDR) treatment standards and minimum technology requirements (MTRs), whereas leaving the contaminated material in place, while less protective, usually led to a much simpler and less expensive remedy. As a result, many owners of contaminated property selected less effective containment actions over ex situ management. In recognition of this, in 1993, U.S. EPA promulgated the CAMU Rule to provide regulatory relief. Under the CAMU Rule, placement of remediation waste into a CAMU did not constitute land disposal and, therefore, LDRs and MTRs did not apply. The Air Force has concluded, and the regulatory agencies have agreed, that consolidating contaminated material excavated at Travis AFB into a CAMU is practical and will protect human health and the environment. Excavating contaminated material and sending it off site to a hazardous waste landfill would not be significantly

more protective (it might be less protective) and was not felt to be practicable because of the high cost.

There are several advantages to the CAMU approach.

- The consolidation of contaminated soil would provide needed material for the construction of the LF007 cap. This would reduce the amount of clean soil that would have to be purchased.

- A large quantity of contaminated soil would never have to leave Travis AFB, avoiding the transport of this soil by truck on major roads and highways. This would reduce air emissions, noise, and the risk of vehicle accidents associated with the cleanup actions.

- The amount of soil that would have to go to commercial off-base landfills would be reduced. This would extend the functional life of these landfills.

- The amount of paperwork generated to track the contaminated soil would be significantly reduced, resulting in a project management cost reduction.

- The use of a CAMU would significantly reduce the cost of cleaning up the other ERP soil sites by reducing or eliminating off-base landfill disposal fees.

Landfill 2 (LF007) is a soil site in the NEWIOU that has been selected as the location for the CAMU. Designation of the CAMU to consolidate soil for the WABOU was part of the WABOU Soil ROD (Travis AFB, 2002a). This landfill was used from the 1950s through the 1970s as a base municipal landfill. As part of the maintenance of the landfill, a large quantity of soil was used to fill in depressions in the soil and cover over the existing waste to provide good surface drainage. This grading also formed the foundation for an ET cap or final ET cover. The ET cover prevents people, animals, and plants from coming in contact with the waste. The ET cover also controls infiltration of rainwater, thereby reducing the leaching of contaminants and protecting groundwater. More details on the final ET cover system are provided in the *LF007 Soil Remedial Action Design Report and Post-Closure Maintenance Plan* (CH2M HILL, 2002). For Travis AFB to place contaminated soil within the CAMU as part of the foundation for the cap over part of LF007, the contaminated soil must meet acceptance criteria that are protective of groundwater. The consolidation requirements are used to ensure compatibility between contaminated soil coming from different sites and compatibility with existing landfill waste and cap materials.

In evaluating whether the use of a CAMU for on-site consolidation of remediation wastes is a viable option, the following seven criteria were considered and met.

1. The CAMU must facilitate the implementation of reliable, protective, and cost-effective corrective action measures.

2. Waste management activities associated with the CAMU shall not create unacceptable risks to humans or the environment.

3. The CAMU shall incorporate uncontaminated areas only if the inclusion of such areas allows better protection.

4. Areas within the CAMU where wastes remain in place after closure of the CAMU shall be managed and contained to minimize the potential for future releases.

5. The CAMU shall expedite the implementation of corrective measures.

6. The CAMU shall enable the use of treatment technologies to enhance long-term effectiveness of corrective actions by reducing the toxicity, mobility, or volume of wastes.

7. To the extent practicable, the CAMU shall minimize the land areas where wastes will remain in place after closure of the CAMU.

To demonstrate that the contaminated soil to be placed in the CAMU will not impact the underlying groundwater in excess of beneficial use objectives (maximum contaminant levels [MCLs]), the Air Force conducted a leachability assessment using the California Waste Extraction Test modified to use deionized water as the extractant (DI WET). A site-specific dissociation constant was calculated by dividing the leachate concentration by the total soil concentration. The CAMU acceptance levels were calculated using the product of the water quality objective, the dissociation constant, and a dilution/attenuation factor as modeled in consideration of the landfill cover and the CAMU cap design. The *Corrective Action Management Unit Soil Acceptance Criteria* Technical Memorandum (Radian, 2001) provides a more detailed description of the leachate assessment.

In the CAMU soil acceptance criteria document, soil and leachate acceptance levels were developed with guidance from the San Francisco Bay RWQCB. They are designed to be protective of groundwater beneficial use objectives. The acceptance levels were developed using SESOIL modeling, RI data, and DI WET analytical results. (Soil samples from Travis AFB were collected and analyzed using the DI WET to have site-specific data on the potential leaching of several contaminants from soils.) The SESOIL modeling, the initial review of RI data, the DI WET results, and the proposed CAMU design support establishing the acceptance levels based on drinking water standards. Modeling results based on CAMU design features show that leachate concentrations of 100 times the MCLs will attenuate in the underlying soil and will result in leachate concentrations at the water table that are less than MCLs. The soil acceptance criteria are protective of groundwater; therefore, the CAMU will not be constructed with a liner and leachate collection and recovery system.

In addition to the protectiveness of the soil acceptance criteria, soil conditions at Travis AFB and the design of the CAMU further ensure the protection of groundwater beneficial use objectives. The soils at Travis AFB are fine-grained silty loams, clay loams, and loams, and the types of contaminants in soil have a natural affinity to sorb to soil, thus reducing potential migration downward. The Air Force plans to use an ET cover to minimize infiltration of water into the consolidated soil, and the fine-grained nature of the soil will impede the percolation and movement of contaminants. The consolidated soil will be placed on top of the subgrade, and then covered with a 4-foot-thick ET cover. The CAMU is designed to include a minimum 5-foot separation between the consolidated soil and the seasonal high groundwater table. The 5-foot separation further protects groundwater beneficial use objectives.