PB95-964614
EPA/ROD/R10-95/124
January 1996

EPA Superfund Record of Decision:

Mountain Home Air Force Base (O.U. 1, 3, 5, 6), ID
9/27/1995

RECORD OF DECISION

FOR

MOUNTAIN HOME AIR FORCE BASE

OPERABLE UNITS NOS. 1, 3, 5, 6

LAGOON LANDFILL AND FIRE TRAINING AREA 8

DECLARATION FOR THE RECORD OF DECISION

DECISION SUMMARY

I. SITE NAME, AND LOCATION 1

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES 5

A. SITE HISTORY 5
B. ENFORCEMENT ACTIVITIES 18

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION 18

IV. SCOPE AND ROLE OF OPERABLE UNIT 20

V. SUMMARY OF SITE CHARACTERISTICS 20

A. TOPOGRAPHY, SURFACE FEATURES, AND CLIMATE 20
B. REGIONAL AND SITE GEOLOGY 21

1. Regional Geology 21
2. Site Geology 21

C. SOILS 22
D. HYDROGEOLOGY 22
E. SURFACE WATER HYDROLOGY 23
F. NATURE AND EXTENT OF CONTAMINATION 23

1. Soils 25
2. Surface Water and Sediment 38
3. Perched Groundwater 41
4. Regional Groundwater 42

4.1 Pre-RI Investigations 42
4.2 Remedial Investigation Results 43

G. GROUNDWATER MODELING RESULTS 46
H. POTENTIALLY EXPOSED POPULATION 50

VI. SUMMARY OF SITE RISKS 51

A. HUMAN HEALTH RISKS 51

1. Contaminant Identification . . . . . -51-
2. Exposure Assessment . . . . . -51-
3. Toxicity Assessment . . . . . -55-
4. Risk Characterization . . . . . -56-

B. ENVIRONMENTAL RISKS . . . . . -63-
C. SUMMARY OF SITE RISK CONCLUSION . . . . . -64-
D. REMEDIAL GOALS FOR SITE ST-11 . . . . . -64-

VII. DESCRIPTION OF ALTERNATIVES . . . . . -64-

VIII. THE SELECTED REMEDY . . . . . -72-

IX. STATUTORY DETERMINATION . . . . . -75-

X. DOCUMENTATION OF SIGNIFICANT CHANGES . . . . . -75-

TEXT TABLES

Table 32	Chemicals of Concern Detected in Groundwater from Either Base Production or Monitoring Wells
Table 33	Maximum Detected Groundwater Concentrations at All Base Wells to RBCs
Table 34	Concentrations of Dissolved Metals (Background) in Groundwater in Wells in Elmore County, Idaho (μg/L)
Table 35	Chemicals of Concern in Groundwater Based on Fate and Transport Modeling Results
Table 36	Model-Estimated Peak 30-Year Average Concentrations Compared to EPA Region III RBCs
Table 37	RME Metals Concentrations in Designated Background Soil Samples (mg/kg)
Table 40	Comparison of Maximum Detected Groundwater Concentrations at All Base Wells to RBCs
Table 41	Alternative Cost Analysis for Site ST-11
Table 42	Cost Analysis for Regional Groundwater Monitoring

TEXT FIGURES

FIGURE 1	LOCATION MAP MOUNTAIN HOME AIR FORCE BASE IDAHO
FIGURE 2	SITE LOCATIONS MAP MOUNTAIN HOME AIR FORCE BASE IDAHO
FIGURE 3	WELL LOCATIONS MAP MOUNTAIN HOME AIR FORCE BASE IDAHO
FIGURE 4	SOILS INVESTIGATION APPROACH

APPENDIX A TABLES 1-31, 38, & 39

APPENDICES

APPENDIX A TABLES 1-31, 38 & 39

Table 1	Summary of Chemicals Detected in Surface Water Samples at the North Cell, Wastewater Lagoons
Table 2	Summary of Chemicals Detected in Surface Water Samples at the East Cell, Wastewater Lagoons
Table 3	Summary of Chemicals Detected in Surface Water Samples at the West Cell, Wastewater Lagoons
Table 4	Summary of Chemicals Detected in Surface Water Samples at the South Cell, Wastewater Lagoons
Table 4a	Lagoon Landfill Lagoon Sediments Volatile Organics μg/kg and Total Petroleum Hydrocarbons mg/kg
Table 5	Summary of Chemicals Detected in Groundwater Samples at MW-1
Table 6	Summary of Chemicals Detected in Groundwater Samples at MW-2
Table 7	Summary of Chemicals Detected in Groundwater Samples at MW-3
Table 8	Summary of Chemicals Detected in Groundwater Samples at MW-4
Table 9	Summary of Chemicals Detected in Groundwater Samples at MW-5
Table 10	Summary of Chemicals Detected in Groundwater Samples at MW-6
Table 11	Summary of Chemicals Detected in Groundwater Samples at MW-7
Table 12	Summary of Chemicals Detected in Groundwater Samples at MW-8
Table 13	Summary of Chemicals Detected in Groundwater Samples at MW-9
Table 14	Summary of Chemicals Detected in Groundwater Samples at MW-11
Table 15	Summary of Chemicals Detected in Groundwater Samples at Perched Wells at MW-12
Table 16	Summary of Chemicals Detected in Groundwater Samples at Perched Wells at MW-15
Table 17	Summary of Chemicals Detected in Groundwater Samples at MW-16
Table 18	Summary of Chemicals Detected in Groundwater Samples at MW-17
Table 19	Summary of Chemicals Detected in Groundwater Samples at MW-18
Table 20	Summary of Chemicals Detected in Groundwater Samples at BPW-1
Table 21	Summary of Chemicals Detected in Groundwater Samples at BPW-2
Table 22	Summary of Chemicals Detected in Groundwater Samples at BPW-4
Table 23	Summary of Chemicals Detected in Groundwater Samples at BPW-5
Table 24	Summary of Chemicals Detected in Groundwater Samples at BPW-6
Table 25	Summary of Chemicals Detected in Groundwater Samples at BPW-7
Table 26	Summary of Chemicals Detected in Groundwater Samples at BPW-8
Table 27	Summary of Chemicals Detected in Groundwater Samples at BPW-9
Table 28	Summary of Chemicals Detected in Groundwater Samples at 30I
Table 29	Summary of Chemicals Detected in Groundwater Samples at 31ABA1
Table 30	Summary of Chemicals Detected in Groundwater Samples at 36AAAA
Table 31	Summary of Chemicals Detected in Groundwater Samples at 5ACCI
Table 38	Summary of Base-Wide Chemicals of Concern in Soils (mg/kg) RME Concentrations of Metals Above Background and Detected Organic Compounds

Table 39 Summary of Base-Wide Chemicals of Concern in Surface Water (mg/kg) RME Concentrations of Metals Above Background and Detected Organic Compounds

LIST OF ACRONYMS

ACC	Air Combat Command
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BPW	Base production well
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of concern
DRMO	Defense Reutilization and Marketing Office
EOD	Explosive Ordnance Disposal
ERA	Ecological Risk Assessment
ET	Evapotranspiration
FFA	Federal Facilities Agreement
gpm	gallons per minute
GRO	Gasoline-range organics
HWMA	Hazardous Waste Management Act
IDHW	Idaho Department of Health and Welfare
LFI	Limited Field Investigation
LOX	Liquid Oxygen
MCL	Maximum Contaminant Level
MHAFB	Mountain Home Air Force Base
MSL	Mean sea level
NCP	National Contingency Plan
OU	Operable Unit
PAH	Polyaromatic hydrocarbons
PCB	Polychlorinated biphenyl
PCOCs	Potential chemicals of concern
POL	Petroleum, Oil, and Lubricants
RAB	Restoration Advisory Board
RAOs	Remedial Action Objectives
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation

RME	Reasonable Maximum Exposure
ROD	Record of Decision
SAC	Strategic Air Command
SARA	Superfund Amendments and Reauthorization Act of 1986
SF	Slope Factor
SVOC	Semivolatile organic compound
TAC	Tactical Air Command
TCE	Trichloroethene
TCO	Total chromatographable organics
THM	Trihalomethane
TPH	Total petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
TVHC	Total volatile hydrocarbons
TVOC	Total volatile organic compound
UCL	Upper confidence limit
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound

DECLARATION FOR THE RECORD OF DECISION
MOUNTAIN HOME AIR FORCE BASE, MOUNTAIN HOME, IDAHO
OPERABLE UNITS NOS. 1, 3, 5, AND 6

SITE NAME AND LOCATION

Mountain Home Air Force Base (MHAFB)
Operable Units Numbers 1, 3, 5, and 6
Mountain Home, Elmore County, Idaho

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected final remedial action for Operable Units (OUs) Numbers 1, 3, 5, 6, and sites at the Lagoon Landfill and Fire Training Area 8, consisting of a total of 33 sites at Mountain Home Air Force Base in Mountain Home, Idaho. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for these sites.

The lead agency for this decision is the U.S. Air Force (USAF). The U.S. Environmental Protection Agency (USEPA) concurs with this decision and, along with the State of Idaho Department of Health and Welfare (IDHW), has participated in the scoping of the site investigation and evaluation of remedial investigation report. The State of Idaho concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from one site of the 33 sites addressed in this ROD, if not addressed by implementing the response action selected in this ROD, may present a potential future threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The OUs 1, 3, 5, and 6 are the final OUs planned for the site. USAF, EPA, and IDHW have determined that no remedial action is necessary under CERCLA for soil or regional groundwater at 32 of the 33 sites within OU1, OU3, OU5, OU6, Lagoon Landfill, and Fire Training Area 8 to ensure protection of human health and the environment.

One site, the Flightline Fuel Spill site (ST-11 - the Perched Zone), will undergo a Limited Action consisting of the following:

- Notice of Restriction which will identify the perched zone and prohibit drilling of the perched zone or use of the perched water as drinking water on the MHAFB Comprehensive Plan. The Plan will be registered on land plat maps held by MHAFB. The land is held by lease by the Air Force and can not go back to the land holder (Bureau of Land Management) until contamination is below MCLs.

- Leak detection program, which will ensure early detection of any future petroleum leaks at the site. The program includes petroleum inventory and annual flight line leak detection programs.

- Sampling of the perched groundwater prior to removal of the land use restriction to ensure that perched water meets the standards of the Safe Drinking Water Act.

- Monitoring of the perched groundwater quality in accordance with the approved groundwater monitoring plan.

The Limited Action alternative addresses the principal threat posed by Site ST-11 because the perched water would only present an unacceptable risk if site use changed and if the perched water could be used as a source of water for residential use.

The No Remedial Action alternative for the regional groundwater includes at least annual monitoring of the regional groundwater. The purpose of the monitoring is to verify uncertainties with the groundwater fate and transport model. Monitoring of contaminants of concern will occur

at least annually in accordance with the groundwater monitoring plan. The monitoring data would then be evaluated as part of the CERCLA 5-year review to determine if continued monitoring of the Snake River Plain regional aquifer is necessary.

STATUTORY DETERMINATION

No remedial action is necessary for soil or groundwater at any of the sites to ensure protection of human health or the environment. The no action remedy for regional groundwater includes monitoring of groundwater. The selected remedy for the perched groundwater at site, ST-11, the Flight Line Fuel Spill, is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. However, because treatment of the principle threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principle element. Furthermore, because the remedy at Site ST-11 will result in hazardous substances remaining on site above health-based levels, a review will be conducted within 5 years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection to human health and the environment.

Signature sheet for the foregoing Operable Units Numbers 1, 3, 5, 6, Lagoon Landfill, and Fire Training 8 Record of Decision between the U.S. Air Force and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Charles Findley 9-27-95

for Chuck C. Clarke Date
Regional Administrator, Region 10
U.S. Environmental Protection Agency

Signature sheet for the foregoing Operable Units Numbers 1, 3, 5, 6, Lagoon Landfill, and Fire Training Area 8 Record of Decision between the U.S. Air Force and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Thad A. Wolfe 20 Oct 95

Thad A. Wolfe
Lieutenant General, USAF
Vice Commander

Date

Signature sheet for the foregoing Operable Units Numbers 1, 3, 5, 6, Lagoon Landfill, and Fire Training Area 8 Record of Decision between the U.S. Air Force and the U.S. Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Wallace N. Cory October 10, 1995

Wallace N. Cory Date
Administrator
Division of Environmental Quality
Idaho Department of Health and Welfare

DECISION SUMMARY
MOUNTAIN HOME AIR FORCE BASE
OPERABLE UNITS NOS. 1, 3, 5, AND 6
MOUNTAIN HOME, ELMORE COUNTY, IDAHO

INTRODUCTION

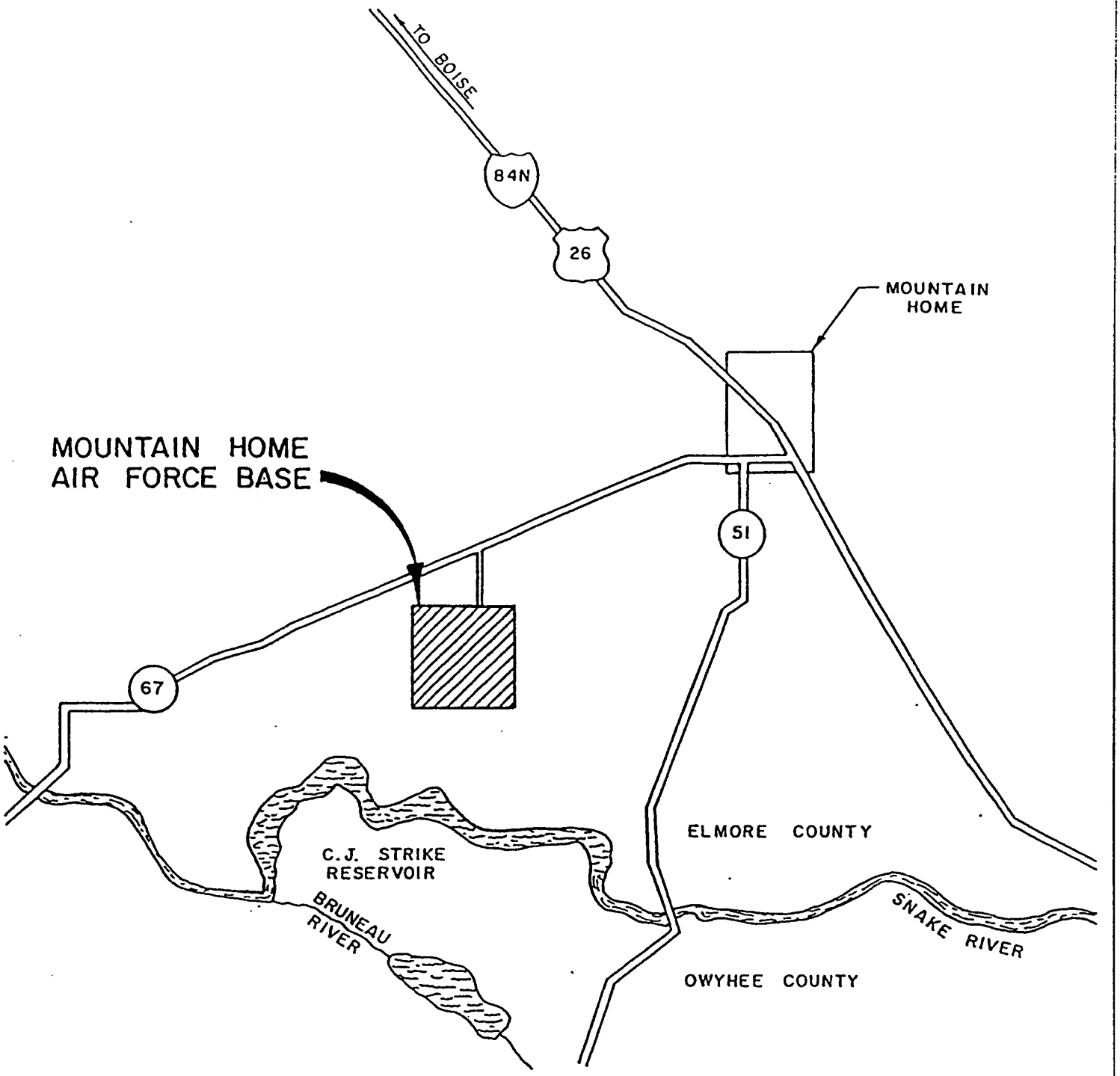
In 1988, Base sampling detected bromoform in a Base production well. Because of this detection, the Base was evaluated using the Hazard Ranking System. In August 1990, Mountain Home Air Force Base (MHAFB) was listed on the USEPA's National Priorities List (NPL) of hazardous waste sites under CERCLA (1980) as amended by SARA (1986). In January 1992, the USEPA Region 10, IDHW, and MHAFB signed a Federal Facilities Compliance Agreement that established a remedial investigation process schedule for MHAFB.

In accordance with Executive Order 12580 (Superfund Implementation) and the NCP, the USAF recently completed the RI/FS process for the four OUs, the Lagoon Landfill, and Fire Training Area 8 addressed in this ROD. The purpose of the RI/FS was to determine the nature and extent of contamination associated with these sites and to evaluate the current and potential future risk to human health and the environment posed by the 33 sites addressed in this ROD. The RI/FS addressed contamination associated with surface water, sediment, soil, and groundwater.

I. SITE NAME, AND LOCATION

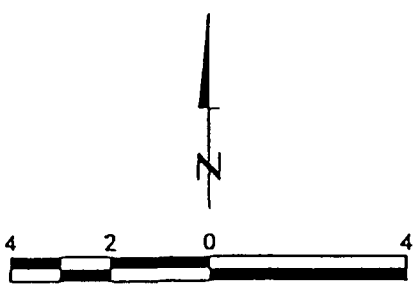
MHAFB is located on about 5,800 acres of land 10 miles southwest of Mountain Home, Idaho, in Elmore County (see Figure 1). MHAFB was established in 1943 and became a Strategic Air Command (SAC) Base in 1948. In 1951, the Base was reassigned to the Military Air Transport Service, and SAC resumed control from 1953 until 1965. Tactical Air Command (TAC) assumed control of the Base in 1965 until 1993. Currently, Air Combat Command (ACC) controls the mission at MHAFB. The total resident population of MHAFB is currently about 7,000 people.

The surrounding current land use for the Base is agricultural. Mountain Home AFB is likely to remain a military installation in the near future of 30 years. The Base is undergoing a significant expansion and is the first wing that will be assigned fighter, tanker, and bomber aircraft. The Snake River is about 2.5 miles south of the Base, but no permanent streams exist on or near the



LOCATION MAP

AREA LOCATION



SCALE IN MILES

Woodward-Clyde
ENGINEERING & SCIENCES APPLIED TO THE EARTH & ITS ENVIRONMENT

LOCATION MAP
MOUNTAIN HOME AIR FORCE BASE IDAHO

DRN BY: CJG	DATE: 07/14/94	PROJECT NO. 92MC520A	FIG. NO. 1
CHK'D BY:	DATE:		

Base. Groundwater is found at approximately 350 to 400 feet below ground surface (bgs) at the Base, and up to 900 feet bgs within the Snake River Plain. Groundwater is the source of drinking water at the Base and is a source of irrigation and drinking water for nearby farm residents adjacent to the Base. The Base currently has 11 Base Production Wells (BPWs) and monitors groundwater quality.

Since the Base was established in 1943, varying quantities of hazardous wastes have been generated and disposed of at MHAFB. The sources of waste include fuel management, industrial and aircraft operations, and fire training activities.

MHAFB was investigated by separating a total of 33 sites into six OUs. Sites at MHAFB with similar operations or investigative activities were grouped into OUs to facilitate the characterization of potential environmental impacts and subsequent actions at the Base. The USAF investigated the 33 sites within OUs 1, 3, 5, 6, the Lagoon Landfill, and Fire Training Area 8 with oversight by the United States Environmental Protection Agency (USEPA) Region 10 and the Idaho Department of Health and Welfare (IDHW).

OU2 was investigated under a previous program and included the "B"-Street Landfill (LF-02) and the soils investigation of the Lagoon Landfill (LF-01). The OU2 ROD was completed in 1993 recommending no action for LF-02. LF-01 was deferred to this ROD. OU4 (Fire Training Area 8) was also addressed in a ROD signed in 1992.

The groundwater pathway for OU2 and OU4 and ST-13 were evaluated as part of the OU3 Basewide groundwater and ecological investigation and is included as part of this ROD. In addition, soils and groundwater of LF-01 are addressed in this ROD.

Following listing on the NPL, OU1 sites were investigated as Limited Field Investigations (LFIs), and sites determined to pose a potential risk to human health or the environment were further investigated in OU6 as Remedial Investigations (RIs) or Phase II LFIs. These include Sites SD-12, SD-24, SD-25, SD-27, SS-29, and OT-16. An underground storage tank (UST) at Fire Training Area 8 (FT08-UST) was also included in OU6. OU3 included Remedial Investigations of the Basewide groundwater, the Basewide ecological risk assessment, and five fuel release sites. The OU5 site consists of a low-level radioactive waste disposal area where a remedial response action (i.e., source removal) was completed. The sites included in these OUs are:

Operable Unit 1

- DP-09 Waste Oil Disposal Area
- DP-18 Old Burial Trench
- FT-04 Fire Training Area 4
- FT-05 Fire Training Area 5
- FT-06 Fire Training Area 6
- FT-07A Fire Training Area 7A
- FT-07B Fire Training Area 7B
- FT-07C Fire Training Area 7C
- LF-03 Existing Landfill
- LF-23 Solid Waste Disposal Area
- OT-10 Perimeter Road
- OT-15 Corker Material Burial Area
- OT-16 Munitions Disposal Area (further studied in OU6)
- SD-12 Entomology Shop Yard (further studied in OU6)
- SD-24 MWR Auto Hobby Shop/Munitions Trailer Maintenance Shop (further studied in OU6)
- SD-25 Flight Line Storm Drain (further studied in OU6)
- SD-27 Vehicle Wash Rack (further studied in OU6)
- SS-26 Drum Accumulation Pad
- SS-28 Former Wash Water Accumulation Basin
- SS-29 Drum Accumulation Pad (further studied in OU6)
- SS-30 DRMO Storage Area
- ST-22 Titan Missile Maintenance Area

Operable Unit 3

- Basewide Groundwater and Ecological Investigation

Fuel Sites (Operable Unit 3)

- ST-11 Flight Line Fuel Spill
- ST-13 POL Underground Storage Tanks (groundwater only)
- ST-31 BX Service Station

- ST-32 MX Service Station
- ST-34 Fuel Hydrant No. 9
- ST-35 Hospital Fuel Spill

Operable Unit 5

- RW-14 Low Level Radioactive Waste Container Storage Area

Operable Unit 6

- SD-12 Entomology Shop Yard
- SD-24 MWR Auto Hobby Shop/Munitions Trailer Maintenance Shop
- SD-25 Flight Line Storm Drain
- SD-27 Vehicle Wash Rack
- SS-29 Drum Accumulation Pad
- OT-16 Munitions Disposal Area
- FT08-UST UST at Fire Training Area 8

Landfill #1

- LF-01 Lagoon Landfill

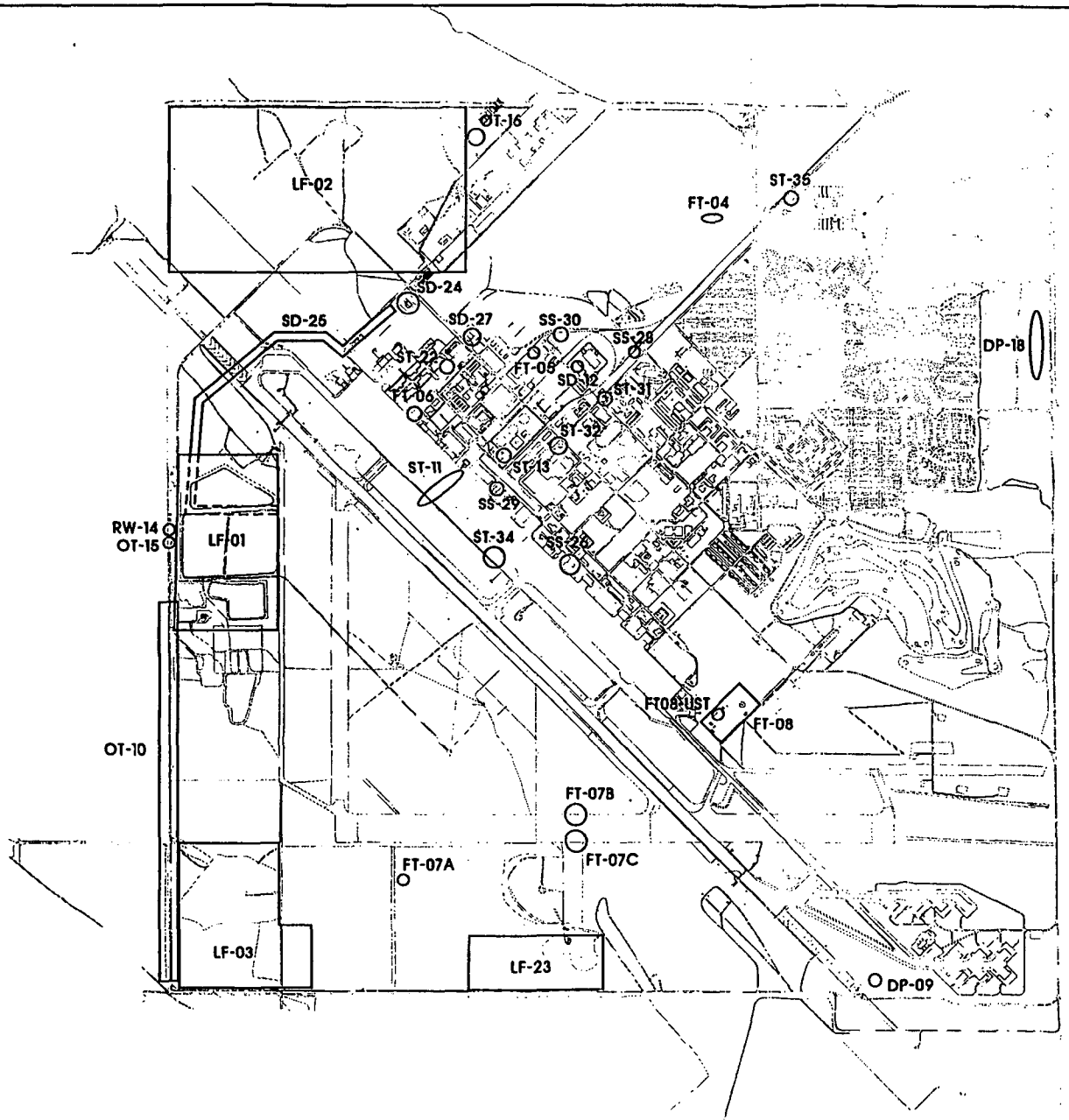
II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. SITE HISTORY

The 33 individual sites are located in various areas at MHAFB (Figure 2). A brief description of each site within the OUs follows. A detailed figure for each site is shown in Mountain Home OU3 RI Documents.

Operable Unit 1

Note: The sites investigated in both OU1 and OU6 are discussed in the OU6 section.



SITES

LF-01	LAGOON LANDFILL
LF-02	"B" STREET LANDFILL
LF-03	EXISTING LANDFILL
FT-04	FIRE TRAINING AREA 4
FT-05	FIRE TRAINING AREA 5
FT-06	FIRE TRAINING AREA 6
FT-07A	FIRE TRAINING AREA 7A
FT-07B	FIRE TRAINING AREA 7B
FT-07C	FIRE TRAINING AREA 7C
FT-08	FIRE TRAINING AREA 8
FT08-UST	UST AT FIRE TRAINING AREA 8
DP-09	WASTE DISPOSAL AREA
OT-10	PERIMETER ROAD
ST-11	FLIGHT LINE FUEL SPILL
SD-12	ENTOMOLOGY SHOP YARD
ST-13	USTs AT POL YARD
RW-14	LOW-LEVEL RADIOACTIVE BURIAL SITE
OT-15	CORKER MATERIAL BURIAL SITE
OT-16	MUNITIONS DISPOSAL AREA
DP-18	OLD BURIAL TRENCH
ST-22	TITAN MISSILE MAINTENANCE AREA
LF-23	SOLID WASTE DISPOSAL AREA
SD-24	MWR AUTO HOBBY SHOP / MUNITIONS TRAILER MAINTENANCE SHOP
SD-25	FLIGHT LINE STORM DRAIN
SS-26	DRUM ACCUMULATION PAD
SD-27	VECHICLE WASH RACK
SS-28	FORMER WASH WATER ACCUMULATION BASIN
SS-29	DRUM ACCUMULATION PAD
SS-30	DRMO STORAGE AREA 1
ST-31	BX SERVICE STATION
ST-32	MX SERVICE STATION
ST-34	FUEL HYDRANT No. 9
ST-35	HOSPITAL FUEL SPILL

N

2000 1000 0 2000
SCALE IN FEET

SOURCE: MOUNTAIN HOME AFB CAD GENERATED SITE MAP

SITE LOCATIONS MAP
MOUNTAIN HOME AIR FORCE BASE IDAHO

DRN BY CJC	DATE 05/10/94	PROJECT NO.	FIG. NO
CHK'D BY	REVISION: 0	92MC520C	2

- **DP-09 Waste Oil Disposal Area** is located within the southeast perimeter of MHAFB near the southeast end of the main runway. The site reportedly operated from about 1953 to 1956. It was reportedly a natural depression where waste oil and possibly other petroleum wastes and solvents were disposed of in trenches about 140 to 170 feet long. These suspected disposal trenches are not currently open, but they are visible as four parallel lines of disturbed soil and contrasting vegetation. The site is now bare ground, and it is not used.

- **DP-18 Old Burial Trench** is located in the northeast part of MHAFB along its eastern perimeter in an open field. It is reportedly an 800-foot-long by 10-foot-deep trench said to have received outdated military supplies, vehicles, small arms munitions, and other solid waste in 1953. The site now contains some demolition debris, and it is nonirrigated and has minimal maintenance.

- **FT-04 Fire Training Area 4** was the first fire training area at MHAFB, and it is located in the north part of MHAFB. Fire training exercises reportedly occurred from 1943 to 1944. Past records indicate fire training exercises were done about twice per week within a bermed area. During each exercise, 200 to 300 gallons of aviation fuel and petroleum, oil, and lubricant wastes were poured onto a mock aircraft and burned. Historical aerial photographs indicate the training exercises occurred within an area about 60 feet wide and 130 feet long. The site is now in an open field that is nonirrigated and has minimal maintenance.

- **FT-05 Fire Training Area 5** was the second fire training area at MHAFB and is located in the north-central part of the Base. Fire training exercises reportedly occurred from 1944 to 1945. Past records indicate fire training exercises were done about twice per week within a bermed area. During each exercise, 200 to 300 gallons of aviation fuel and petroleum, oil, and lubricant wastes were poured onto a mock aircraft and burned. The site is now under the northeast part of supply warehouse Building 1325.

- **FT-06 Fire Training Area 6** is the site of a former fire training area located in the west-central part of MHAFB. Fire training exercises were completed twice per week from 1948 to 1950 and 1951 to 1953. During each exercise, 200 to 300 gallons of aviation fuel and petroleum, oil, and lubricant wastes were poured

onto a mock aircraft and burned. The site is currently mostly overlain by flightline concrete and asphalt.

- **FT-07A Fire Training Area 7A** was a fire training area located in the southwest part of MHAFB. Fire training exercises reportedly occurred from 1953 to 1962. Past records indicate fire training exercises were done about twice per week within a circular-shaped bermed area. During each exercise, 200 to 300 gallons of aviation fuel and petroleum, oil, and lubricant wastes were poured onto a mock aircraft and burned. Historical aerial photographs indicate the training exercises occurred within a circular area about 480 feet wide. The site is south of an abandoned east-west runway in an open field that is nonirrigated and has minimal maintenance.

- **FT-07B Fire Training Area 7B** is located in the south-central part of MHAFB. It was a fire training area which operated from about 1953 to 1962. Past records indicate fire training exercises were done at two small burn pits about twice per week. During each exercise, 200 to 300 gallons of aviation fuel and petroleum, oil, and lubricant wastes were poured onto mock aircraft and burned. The site is north of an abandoned east-west runway in an open field that is nonirrigated and has minimal maintenance.

- **FT-07C Fire Training Area 7C** is located in the southwest part of MHAFB. It was a fire training area which operated from about 1953 to 1962. Past records indicate fire training exercises were done at two small burn pits about twice per week. During each exercise, 200 to 300 gallons of aviation fuel and petroleum, oil, and lubricant wastes were poured onto a mock aircraft and burned. The site is south of an abandoned east-west runway in an open field that is nonirrigated and has minimal maintenance.

- **LF-03 Existing Landfill** is located in the southwest part of MHAFB. It is the currently operating landfill and has operated as a sanitary landfill for the Base since 1969. Because it is an open/operating landfill, it is designed, operated, and monitored to comply with both state and federal regulations that apply to municipal landfills. There is no documented record or history of hazardous materials being placed in this landfill.

- **LF-23 Solid Waste Disposal Area** is a former landfill area in the south-central part of MHAFB about 100 feet north of the southern base boundary. Exact dates of landfill operation are not known; however, historical aerial photographs indicate that the solid waste disposal area was present as early as October 1950 and consisted of three burial trenches or depressions. Debris disposed in the trenches included tires, household refuse, and other solid waste. The site is now an open field that is nonirrigated and that receives minimal maintenance.

- **OT-10 Perimeter Road** is along the MHAFB western boundary, south of the wastewater lagoons. Waste oils were placed on a perimeter road for dust control. The practice may have begun as early as 1943, and it ended in 1975. A truck equipped with a vacuum system collected waste oils from the flight line, motor pool, and auto hobby shop. Waste oil was reportedly applied to the entire width of the road surface. This perimeter road was paved with crushed asphalt sometime after 1987 and remains an active roadway.

- **OT-15 Corker Material Burial Area** is located along the western boundary of MHAFB adjacent to the west side of the wastewater lagoons. Components of aircraft wings containing a boron-fiber composite known as "corker material" were reportedly buried at this site in 1979 after the crash of an airplane. The site is now in an open field that is nonirrigated and that receives minimal maintenance.

- **SS-26 Drum Accumulation Pad** is located centrally along the Base Flightline near Building 208, which includes the Wheel and Tire Shop. SS-26 served as an accumulation point for that operation. The site is a 10-foot by 10-foot continuous-pour concrete pad that was used for temporary storage of drummed waste solvents and petroleum, oil, and lubricants (POL) wastes that were routinely collected for reuse, resale, or disposal. The pad was likely poured in the mid-1970s, and it was used until a nearby covered storage building was constructed in 1990. Most of the drummed wastes stored on the pad were from the Wheel and Tire Shop, 366th Equipment Maintenance Squadron. The largest volume of waste generated was PD-680, a petroleum-distillate-based solvent. The site is currently inactive and no waste materials are stored on the pad.

- **SS-28 Former Wash Water Accumulation Basin** is located in the north-central part of the Base. The site was part of a maintenance facility for the Base railroad that was used from 1943 until 1987. It was a small unlined pit on the west side of a maintenance building that received wash water and solvents that had been used to clean locomotives. In 1987, soils around and beneath the pit were reportedly removed, and the excavation was backfilled with clean fill. The depression is no longer present and wash water is contained in 55-gallon drums for proper disposal. The site is bare ground.

- **SS-30 DRMO Storage Area** is located in the north-central part of the Base. The area is a former unlined and unbermed storage pad that is located within the larger operating Defense Reutilization and Marketing (DRMO) area, which is a permitted RCRA facility. Before December 1987 the storage pad was used as a temporary storage point for drummed wastes that were collected from Base shops and other military facilities in the region. Wastes were processed for recycling, resale, or disposal based on the nature, quantity, and purity of the wastes. The site is currently paved with asphalt and is used to temporarily store nonhazardous scrap metal and office furniture for later sale.

- **ST-22 Titan Missile Maintenance Area** is located in the northwest part of the Base. Exact dates of operation for the facility are not known; however, the three off-Base Titan missile sites operated by the Base were active from April 1962 to June 1965. Four USTs that historically contained solvents, acids, and caustic solutions were located within this site. The USTs were abandoned by filling them with sand, and sealing the manway entry ports with cement. The site is currently paved and remains part of the active flightline near the hangar complex.

Operable Unit 3

- **Basewide Groundwater/Ecological Investigation.** The groundwater operable unit consists of the Snake River Plain Aquifer (regional aquifer) 350 to 400 feet below ground surface at the Base. It considers potential releases of chemicals of concern to the groundwater from all 33 sites investigated as part of the CERCLA process.

The ecological evaluation considers the potential adverse impact (individually and collectively) that exposure to environmental media (surface water, sediment, and soil) at the 33 sites may have on ecological receptors (individuals and populations of plant and animal species).

Fuel Sites

- **ST-11 Flight Line Fuel Spill** is located in the west-central part of the Base. The leak occurred from a 3/4-inch ventline for a 16-inch fueling line. The fueling line carries jet fuel (JP-4) from the POL Yard to fueling hydrants along the flight line. The leak occurred soon after the fueling system was installed. Available information suggests that the leak occurred during the first half of 1957. Interview information indicates that the leak was intermittent and ongoing for a period of two to three months. During this time, as much as 50,000 to 90,000 gallons of fuel may have been released via the ventline leak. Upon discovery of the leak, the ventline was repaired and new access manholes were installed over the fueling line at the leak location. A leak detection system has been installed along the trace of this and all active fuel pipelines at Mountain Home AFB. This system is sampled annually to check for current leakage. To date, no leakage has been detected and the pipeline system remains operational. The site is almost entirely under concrete. It is under an active aircraft parking apron.

- **ST-31 BX Service Station** is located in the central part of the Base. The facility originally included a service building, three gasoline dispenser islands, and three 10,000-gallon steel USTs that were installed in 1955 and used to store leaded and unleaded gasoline. Pumps and piping were replaced in 1983. Tank/piping tightness tests done in 1992 indicated that one of the tanks and its piping were leaking. The other two tanks passed the test. The duration of fuel release is not known, but the leak may have occurred over a period of years. The tank that failed the test, its associated piping, and approximately 800 cubic yards of contaminated soil were removed from the site, and the excavation was backfilled with clean fill. The BX Service Station remains an active facility, and it is regulated under the Idaho UST program. Most of the site is paved with asphalt parking lot or covered with buildings. Some areas of exposed soil exist.

- **ST-32 MX Service Station** is located in the central part of the Base. A 60-foot by 80-foot concrete pump-island pad was present in the center of the site. Six concrete pump islands were on the pad. The MX Service Station was constructed in 1948 to supply fuel to military vehicles. Original features included a service building (T-1113), one 5,000-gallon steel UST (diesel), one 12,000-gallon steel UST (gasoline), and one 19,000-gallon steel UST (diesel). Some piping changes were made in 1962, and two new pumps were added in 1991. The 12,000-gallon and 19,000-gallon USTs were removed in February 1992, and the 5,000-gallon UST was removed in May 1992. A 3-mm-diameter hole was observed in the 12,000-gallon UST after it was removed. Contaminated soil was removed and taken to the Base biotreatment area. The excavations were backfilled with clean fill. All surface structures have been subsequently removed and the site remains an open lot. Most of the site is covered by asphalt or concrete with some small areas of exposed soil.

- **ST-34 Fuel Hydrant No. 9** is located in the central part of the Base. The site includes Fuel Head No. 9, the fuel line that runs west under the taxiway, and the metering pit immediately west of the taxiway. The site is part of the JP-4 fueling system that was installed at the Base during the mid-1950s. The hydrant system was used to both meter fuel to aircraft and to defuel aircraft. After fueling operations and during defueling, fuel from the line to the fuel head drained back to the metering pit. The delivery pump in the metering pit transferred fuel to a defueling tank located near Fuel Hydrant No. 9. In April 1991, a fuel leak was detected at the metering pit. The fuel hydrant, the metering pit, and adjacent soils were excavated and removed. Almost the entire site is located under the concrete aircraft parking apron and the concrete taxiway.

- **ST-35 Hospital Fuel Spill** is located in the northeast part of the Base. The site consists of a fuel line that is under the hospital access road that intersects with Main Avenue. The release occurred in the mid-1980s (probably 1985 or 1986). According to Base records, the pipeline was cut by a tooth on a grading machine during construction of the access road. An estimated 800 to 1,000 gallons of JP-4 were released from the pipeline under nonpumping gravity flow conditions. The pipeline was reportedly repaired the day following the release. The Base reportedly recovered 350 to 400 gallons of fuel from the ground by pumping the

fuel into bowsers. Soils at the release site were excavated immediately to a depth of 3.5 feet over an area about 50 feet in diameter, centered on the release point. The extent of contamination during excavation was reportedly determined by the presence of fuel odors and soil staining. Subsequent to the fuel line release and repair, a soil vapor monitoring system was installed along all active fuel distribution pipelines at Mountain Home AFB. No ongoing leakage has been detected at the site.

Operable Unit 5

- **RW-14 Low Level Radioactive Waste Container Storage Area** was located along the west perimeter of MHAFB and consisted of two low-level radioactive waste containers buried vertically in the ground. The containers reportedly contained radium-illuminated aircraft instruments and possibly some medical radiology waste. The containers consisted of an 18-foot-long section of Schedule 120, black iron pipe that was used for a period of two years during the mid-1950s and about 20 feet of several 55-gallon drums that were welded together. The period during which the 55-gallon drums may have been used is not known. A separate removal action was completed at the site. The containers were removed and were disposed at a licensed off-Base disposal facility (Richland, Washington). Testing at the time of the removal action indicated no contamination of site soils. The site is now in an open field that is nonirrigated and that receives minimal maintenance.

Operable Unit 6

- **SD-12 Entomology Shop Yard** was located in the north-central part of MHAFB. Site facilities included a building approximately 40 feet by 60 feet and two 1,000-gallon USTs located north and northwest of the building. The building was constructed in 1958 and was converted to the Entomology Shop in the late 1960s. The facility was used to store and handle herbicides, pesticides, and application equipment. The application equipment was filled and cleaned within the building. Wastewater generated from cleaning the application equipment was discharged to surface soils outside the building through a concrete ditch and later through a buried drainpipe from 1969 to 1981. After 1981, the wastewater was collected in

an UST installed adjacent to the northwest side of the building. The Entomology Shop was demolished and the USTs were removed in 1987. Currently, the site is covered with asphalt and used as a parking lot.

- **SD-24 Morale, Welfare, and Recreation (MWR) Auto Hobby Shop/Munitions Trailer Maintenance Shop** is located in the northwest part of MHAFB. This facility was originally built in 1960 and 1961 as a liquid oxygen (LOX) production and helium loading plant. The original plant included LOX and liquid nitrogen storage vessels (currently removed), a chemical waste collection tank/oil sump, a concrete-lined blow-down trench (drain trough) for storage vessel pressure relief that had a trough sump and a dry sump at the south end, and a drainage flume and rock infiltration gallery used to control surface water runoff. The facility became the MWR Auto Hobby Shop in 1965. Waste oil was typically removed from the site; however, between 1965 and 1974, some waste oil was placed in the drain trough and on the surface soils located southwest of the building. According to one interview record, in 1985 waste solvents were disposed of in animal holes located within the fenced yard at the site; however, this record could not be substantiated through soil borings or soil gas analysis. The drain trough and trough sump were capped with concrete in the mid-1980s. The waste collection tank was taken out of service, cleaned, and the drain line from the shop was plugged. The Munitions Trailer Maintenance Shop has occupied the facility since about 1982 and remains the active function of the facility.

- **SD-25 Flight Line Storm Drain** is located in the northwest part of the Base. Storm water runoff from the flight line area, parking lots, and streets, and waste water from former and current operation facilities drain into the Flight Line Storm Drain site. Site SD-25 includes about 6,000 feet of open ditches and about 7,000 feet of underground drainage. A check dam controls storm water flow out of the MHAFB property. Two discharge lines from oil/water separators at flightline shops outfall into the open ditch. The flightline drain culvert system and open ditch remain active and standing water is present in certain segments of the ditch year-round. Hazardous waste is no longer discharged to any portion of the site.

- **SD-27 Vehicle Wash Rack** is located in the northwest part of the Base. It is used to clean construction vehicles. The site consists of a concrete wash rack located north of Building 1354 that was built in the 1960s. The wash rack drainage ditch and a concrete drum storage pad are located northeast of the wash rack area. Prior to the mid-1980s, a petroleum-distillate-based degreasing agent was used to clean grease and asphalt from vehicles. Wash water was discharged to the unlined wash rack drainage ditch, and soils and sediment were reportedly removed from the ditch on an annual basis until about 1990. An interview record alleges a spill of mixed solvent wastes from four drums on the parking area located east of the wash rack. Bulk storage of drums occurs within the fenced drum storage area. Leaking and overfilled waste oil drums and visibly stained soils were reported at the drum storage area in 1986. The wash rack drainage ditch was graded over in the fall of 1993, and a new oil/water separator and piping were installed to receive the waste water discharges from the Vehicle Wash Rack.

- **SS-29 Drum Accumulation Pad** is located in the central part of the Base. It consists of a concrete pad approximately 20 feet by 35 feet in size that was used as a temporary accumulation area by the Propulsion Shop and the Nondestructive Testing Laboratory. Chemical wastes, including solvents, penetrants, emulsifiers, fuel, and hydraulic oil, were stored in drums on the fenced pad from the mid-1970s until 1990. Spilled waste was reportedly observed along the outside of the fence in 1986. The pad is currently inactive and no wastes are stored there.

- **OT-16 Munitions Disposal Area** is located in the north-central part of MHAFB near the northern perimeter fence. The site consisted of two burn operation areas operated by Explosive Ordnance Disposal (EOD) personnel. The facility was built sometime between 1950 and 1957. One burn operation was fueled by a 50-gallon diesel fuel tank. This operation was a popping furnace located in the center of a large circular graded area about 500 feet in diameter. It consisted of a concrete and steel structure with a steel plate that was heated to detonate munitions. Only the concrete blast-wall remains at the site. The popping furnace was dismantled in the fall of 1992 after it was determined not to be contaminated. The dismantled popping furnace was taken off Base as scrap, and the furnace area was clean-closed under State of Idaho Hazardous Waste Management Act (HWMA) regulations (the State's equivalent program to USEPA's RCRA). A second burn

area was an open burn pit about 60 feet long and 30 feet wide. Munitions were placed in the pit along with wood and fuel, ignited, and allowed to detonate. The open burn pit has not been used since April 1990. The Munitions Disposal Area remains an inactive facility.

- **FT08-UST, UST at Fire Training Area 8** was located in the south-central part of the Base. The site consists of a former UST associated with the fuel distribution system for the old burn pit at Fire Training Area 8. The UST was installed in about 1977 and had a 15,000 gallon capacity, and was used to store jet fuel (JP-4). JP-4 used for the fire training exercises was pumped from the UST to the old burn pit. There is no record of leaks from the UST. The UST was located inside of the currently used MHAFB fire training area compound. The UST and its associated pipe system were removed in 1993 and the excavation was backfilled.

Lagoon Landfill

- **LF-01 Lagoon Landfill** is a former landfill that is located near the west boundary of the Base and beneath the Base wastewater lagoons. The wastewater lagoon system consists of four lagoon cells with a total surface area of about 73 acres and an average depth of 3.5 to 4 feet. The lagoon cells were built in 1961. The landfill trenches beneath them served as the main Base landfill prior to construction of the lagoon system. A separate Remedial Investigation/Baseline Risk Assessment was done at the wastewater lagoons as part of OU2. Samples of lagoon water and lagoon sediment were collected and analyzed.

  The results of the OU2 RI/BRA indicated that volatile organic compounds, semivolatile organic compounds, pesticides/polychlorinated biphenyls (PCBs), and metals are present in lagoon sediments. The Baseline Human Health Risk Assessment and Baseline Ecological Risk Assessment for the site shows that no unacceptable risks to humans or populations of key ecological receptors are expected from current or future exposures to lagoon sediment or water; however, individual animals may be at risk. Because the lagoons were considered to be a potential continuous source of chemicals to groundwater, LF-01 is also included in the Basewide groundwater investigation in OU3.

Groundwater Pathway Sites

- **ST-13 POL Underground Storage Tanks** was previously investigated by CH2M-Hill in early 1983 and is located at the POL Yard and consisted of four USTs reportedly located just southeast of Building 1307 (small pumphouse). The USTs were either 12,000-gallon or 15,000-gallon tanks which received segregated POL wastes: waste solvents, waste synthetic oils, waste mineral oils, miscellaneous waste fuels (JP-4 mostly), and petroleum products. The age of the tanks is unknown, and it is also not known if the tanks were associated with Facility 1308 or with Building 1307. They were removed in a RCRA non-clean closure in June 1988 by U.S. Pollution Control, Inc., and soil samples collected before and during the removal showed various detects of VOCs. The site was in the OU3 RI to evaluate possible releases of POL wastes to groundwater.

- **FT-08 Fire Training Area** Site FT-08 was investigated in the OU4 RI/BRA Report (W-C 1991a). It is an abandoned fire training exercise area that was in use from 1962 through 1986. It includes a bermed pit used to contain the fuel which was then ignited for the fire-fighting exercise. From 1962 to 1975, the fuel included aviation gas (AVGAS), motor gas (MOGAS), and possibly spent solvents and waste POLs. From 1975 to 1986, jet fuel (JP-4) was used. (Note that information given to IDHW by one interviewee alleges that TCE disposal occurred at the site after 1975.) The investigation results at FT-08 show that site soils are contaminated with varying concentrations of VOCs, SVOCs, petroleum hydrocarbons, and metals. The highest concentrations of these compounds were found in the surface soils within the bermed area and in the soils underlying the bermed area. The results of the Human Health Risk Assessment and Ecological Risk Assessment indicate no unacceptable health risks are expected from exposure to soils at FT-08. No further action was recommended for this site. The OU4 vadose zone modeling considered leaching only by precipitation of contaminants currently in soil. FT-08 was included in OU3 fate and transport modeling to consider the possible impacts on groundwater of past releases and of past infiltration of applied water.

B. ENFORCEMENT ACTIVITIES

In January 1991, USAF, EPA, and IDHW entered into a Federal Facilities Agreement (FFA) that was made final in January 1992. The FFA established a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions conducted at MHAFB. Under the terms of the FFA, EPA and IDHW provided oversight of subsequent RI activities and agreed on the final remedy set forth in this ROD.

Investigation of the SWMUs addressed in this Record of Decision was done pursuant to Module 4 of the Mountain Home AFB HWMA Permit. Any SWMU not addressed in this ROD or the OU2 or OU4 ROD are subject to the conditions of the HWMA Permit.

The DRMO is the only HWMA permitted site at Mountain Home AFB. Two other sites, ST-13 and OT-16, were both closed following RCRA (HWMA) procedures. Site ST-13 was closed with petroleum contamination left in place and Site OT-16 was clean closed.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The following community relations activities were conducted during the Limited Field Investigations and Remedial Investigations/Baseline Risk Assessments:

- The USAF developed a Community Relations Plan in May 1991 as part of the overall management plan for environmental restoration activities at the Base. The Community Relations Plan was designed to promote public awareness of the investigations and public involvement in the decision-making process.

- The Technical Review Committee was formed in 1992 as a method to keep state and local officials updated on the progress of the investigation.

- In an effort to more fully involve the public, the Technical Review Committee was modified to create a Restoration Advisory Board (RAB). The elected officials and regulatory agencies continued their membership, and an additional six local citizens were nominated by their peers to serve on the board. The board is co-chaired by a MHAFB official and one of the new community RAB members. Members are requested to review draft as well as final documents, and are

responsible for bringing community concerns to the meetings. The RAB has met quarterly since April 1994. Notices inviting the public to the RAB meetings appeared in the Mountain Home News and the MHAFB Gunfighter.

- A tour of MHAFB environmental restoration sites was conducted on June 7, 1995, in preparation for the public comment period on the Proposed Plan.

- The Proposed Plan was released on June 19 and was mailed out to RAB members on the mailing list. A notice was published in the MHAFB Gunfighter, Mountain Home News, and the Idaho Statesman announcing the meeting.

- A public comment period for remedial alternatives was open from June 19 to July 19, 1995. A public meeting to discuss remedial alternatives and receive public comments was held on June 26, 1995, at Mountain Home High School. One person from the public attended.

- No comments were received during the public comment period; therefore this ROD does not include a Responsiveness Summary.

- The documentation which supports this ROD is available for public review in the Information Repository at the following location:

  Mountain Home Air Force Base Library
  520 Phantom Avenue, Building 2427
  MHAFB, ID 83648-5224
  Phone: (208) 828-2326

Hours:	Monday - Thursday	9 a.m. - 9 p.m.
	Friday	9 a.m. - 5 p.m.
	Saturday - Sunday	10 a.m. - 4 p.m.

- The remedy selection is based on the Administrative Record at the following locations:

Mountain Home Air Force Base
366 (CES/CEVR)
1030 Liberator Street
MHAFB, ID 83648
Phone: (208) 828-2338

IV. SCOPE AND ROLE OF OPERABLE UNIT

There are 6 OUs considered at MHAFB. Two of the OUs, OU2 (ROD signed in June 1993) and OU4 (ROD signed in June 1992) have been previously addressed with recommendations of No Further Action. Four remaining OUs and two sites, one from OU2 and one from OU4, are addressed in this ROD. OU1 and OU6 address soils. OU3 addresses fuel releases, potential releases to Basewide groundwater from all sites in all OUs, sediment from the Lagoon Landfill, and evaluation of individual and cumulative ecological risk for all sites in all OUs. OU5 was a removal action for two containers for low-level radioactive wastes.

V. SUMMARY OF SITE CHARACTERISTICS

A. TOPOGRAPHY, SURFACE FEATURES, AND CLIMATE

MHAFB is located on the Mountain Home Plateau, a rolling upland plain covered primarily with lava and windblown sediment. Scattered shield volcanoes and cinder cones rise several hundred feet above the plain. The plateau slopes gently downward toward the north, west, and southwest. Elevations range from 2,700 to 3,200 feet above mean sea level (MSL).

The Snake River forms the southern and southwestern boundary of the Mountain Home Plateau. The plateau is drained by a series of intermittent streams that discharge to the Snake River during rainy periods.

The climate at MHAFB is arid. The area receives about 8 inches of precipitation annually. Evapotranspiration (ET) is between 5 and 9 inches per year. This results in an annual net precipitation of about +3 inches to -1 inch. The 100-year, 24-hour storm event results in 2 inches of precipitation. The 25-year, 24-hour storm event results in 1.6 inches of precipitation.

Area wind directions are highly variable, arising predominantly from the northwest during the spring and summer and from the east and east-southeast during the fall and winter.

No floodplains or historic sites are on Mountain Home AFB. One area, the Flight Line Storm Drain (SD25) is considered a wetland. This is a man-made feature and conveys storm water and Flight Line Shops' waste water to a series of surface water treatment lagoons. No known endangered species inhabit the Base.

B. REGIONAL AND SITE GEOLOGY

1. Regional Geology

The Mountain Home Plateau, on which MHAFB is located, is underlain by over 10,000 feet of volcanic and sedimentary rocks. The principal geologic formations of interest are the Glenns Ferry Formation, the Bruneau Formation of the Idaho Group, and the Snake River Group, which is the uppermost bedrock unit. The Snake River Group, which is 550 feet thick, consists of several basalt flows and unconsolidated alluvial deposits. The basalt originated from volcanic sources as much as 60 miles east of MHAFB. The Snake River Group forms the bedrock at MHAFB and elsewhere in the Mountain Home Plateau.

Wind-blown and alluvial deposits overlie the Snake River Group. These deposits consist of a layer of unconsolidated silt and sand ranging in thickness from several inches to approximately 30 feet.

2. Site Geology

In the vicinity of Mountain Home, Idaho, and the Base, the upper geologic unit is mostly Pleistocene basalt of the Snake River Group. Site specific geology is summarized as follows:

- Unconsolidated silt or fine sand from a few feet to more than 20 feet thick covers basalt over most of the Base

- Basalt beneath the Base is between 490 and 580 feet thick

- As many as 12 interbed (windblown or waterlain sediments that might impede the vertical movement of water in the vadose or phreatic zone) or interflow (rubbly, broken, or horizontally fractured zones that facilitate horizontal movement of water in the vadose or phreatic zone) intervals are present in the basalt below the Base; in the vadose zone, infiltration water may reach a zone of low vertical hydraulic conductivity (interbed or dense basalt) and pond in a zone of higher hydraulic conductivity (interflow or fractured basalt); such a zone is a "perched groundwater" zone, and the rate of infiltration from such a zone depends on the contrast in vertical hydraulic conductivity between the material in which the water is held and the material that has impeded infiltration of the vadose water

- Available data suggest that all of these interbed or interflow intervals are discontinuous across the Base

- Some intervals are continuous across a small portion of the Base

- One or two of the deeper intervals appear to be more continuous than shallower intervals

C. SOILS

Soils at MHAFB are typical of the entire plateau, consisting mostly of wind-blown silt and sand. Typical permeabilities of site soils are reported to be low to moderate ranging from 0.6 to 6.0 in/hr. The different soil series occurring on Base include: the Bahem, the Garbutt, the Minidoka, the Minveno, the Royal, and the Trevino. These soils are typical of the arid environment found in the Mountain Home Area.

D. HYDROGEOLOGY

In the vicinity of MHAFB, the regional aquifer is in the basalts of the Snake River Group. Regional groundwater flows in a southerly direction toward the Snake River at a gradient of about 1 foot per 1,000 feet. At the Base, the gradient is lower, between 1 foot per 10,000 feet and 1 foot per 100,000 feet. The principal recharge area for the aquifer underlying the Mountain Home Plateau is in the mountains north of the plateau where precipitation infiltrates directly into

rock outcrops. A small amount of recharge is probably provided by deep percolation of intermittent stream flow and excess irrigation water.

Drinking water at MHAFB is obtained from nine Base production wells completed in the Snake River Group basalts. The Base production wells range in depth from 379 feet to 610 feet bgs. The water table at the Base occurs at a depth of about 350 feet bgs. Calculations of aquifer transmissivities (rate of water movement through the aquifer) for the Base production wells result in values ranging from 65,000 to 650,000 gallons per day per foot. An average yield of 1,094 gpm was calculated in 1987 from available well production data.

Within a 2-mile radius of the Base, about 35 private wells have been drilled, ranging from 300 to 700 feet in depth. Several wells are downgradient (south) of the Base. The locations of on-Base and off-Base wells are shown on Figure 3.

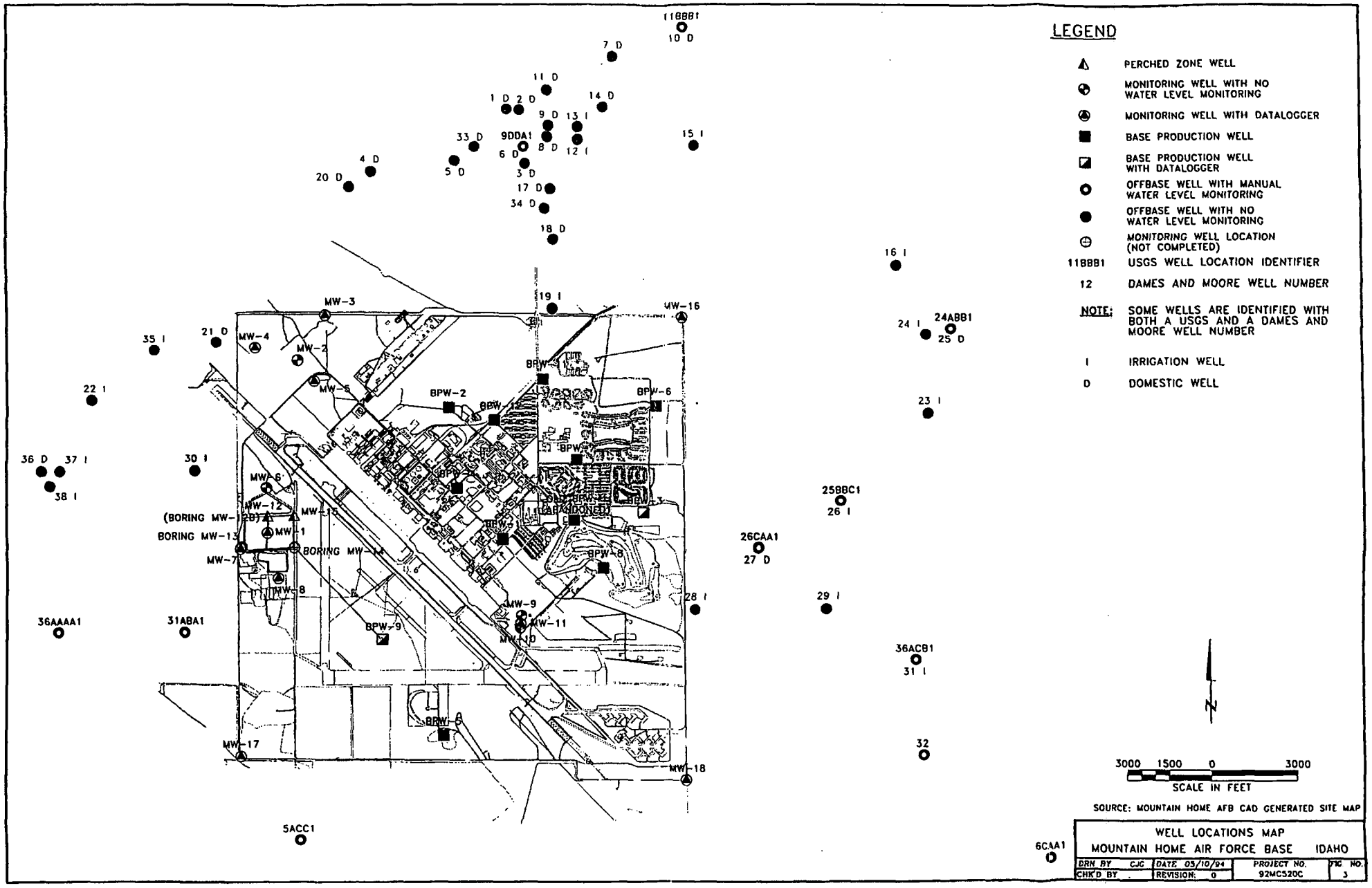
Halls Ferry Springs and Weatherby Springs are both located about 2.5 miles south of the Base along the north canyon wall of the Snake River. Both springs are discharge points for the regional aquifer.

E. SURFACE WATER HYDROLOGY

The Snake River is the primary surface water feature in the Mountain Home area. Two ephemeral streams, Canyon Creek (located to the west) and Rattlesnake Creek (located to the east), are near the Base. When flow events occur, both Canyon Creek and Rattlesnake Creek discharge to the Snake River. Base drainage discharges to Canyon Creek on the few occasions when storm water is released from the dam across the Base storm water drain.

F. NATURE AND EXTENT OF CONTAMINATION

This section presents the findings of the soils, groundwater, sediment, and surface water investigations for OUs 1, 3, 5, 6, Lagoon Landfill, and Fire Training Area 8 at MHAFB.


LEGEND
PERCHED ZONE WELL
MONITORING WELL WITH NO WATER LEVEL MONITORING
MONITORING WELL WITH DATALOGGER
BASE PRODUCTION WELL
BASE PRODUCTION WELL WITH DATALOGGER
OFFBASE WELL WITH MANUAL WATER LEVEL MONITORING
OFFBASE WELL WITH NO WATER LEVEL MONITORING
MONITORING WELL LOCATION (NOT COMPLETED)
11BBB1 USGS WELL LOCATION IDENTIFIER
12 DAMES AND MOORE WELL NUMBER
NOTE: SOME WELLS ARE IDENTIFIED WITH BOTH A USGS AND A DAMES AND MOORE WELL NUMBER
I IRRIGATION WELL
D DOMESTIC WELL
3000 1500 0 3000
SCALE IN FEET
N
SOURCE: MOUNTAIN HOME AFB CAD GENERATED SITE MAP
WELL LOCATIONS MAP
MOUNTAIN HOME AIR FORCE BASE IDAHO
DRN BY CJC
CHK'D BY
DATE 05/10/94
REVISION: 0
PROJECT NO. 92MC520C
FIG NO. 3
11BBB1
10 D
7 D
11 D
1 D 2 D
14 D
9 D
13 I
33 D
9DDA1
8 D
12 I
15 I
4 D
6 D
5 D
3 D
20 D
17 D
34 D
18 D
16 I
MW-3
19 I
MW-16
24 I
24ABB1
25 D
35 I
21 D
MW-4
MW-2
MW-5
BPW-2
BPW-6
22 I
23 I
36 D
37 I
38 I
30 I
MW-6
MW-12
MW-15
(BORING MW-12B)
BORING MW-13
MW-1
BORING MW-14
MW-7
MW-8
25BBC1
26 I
26CAA1
27 D
BPW-8
28 I
29 I
36AAAA1
31ABA1
MW-9
MW-11
MW-10
BPW-9
36ACB1
31 I
MW-17
32
MW-18
5ACC1
6CAA1
05/11/1995 11:58
92520C02.DWG

1. Soils

Investigative Approach

Figure 4 is a flow diagram that shows the approach used. The approach consisted of six steps which leads into the risk management decision-making process.

Step 1 in the process was to evaluate the site history and identify potential chemicals of concern (PCOC) and possible "hot spot" release points. A PCOC was selected using the site history to identify compounds and specific chemicals that may have been released at a site. For chemicals except metals, if it was detected, it was considered a PCOC. For metals, if it was considered a site-related chemical and it was above the established site background, it was considered a PCOC.

Step 2 was the evaluation of Fire Protection Training Areas (other sites move directly to Step 3) using soil vapor surveys to identify if volatile organic compounds (VOCs) were present in the soils. If no VOCs were present, then no further investigation of the site was done and all pathways were considered incomplete, thus eliminating the soil and groundwater pathways. The criteria used included the exceedances of 1 ppm total volatile organic hydrocarbons. If the 1 ppm was exceeded, the process moves to Step 3.

Step 3 of the process included the sampling surface and subsurface soil and analysis of those areas where a release of chemicals ("hot spots") likely occurred. The identification of release points was based on an evaluation of site history and processes used at the site.

If potential chemicals of concern or metals were detected above background, the site moved to Step 4 of the process. If PCOCs were not detected and metals were below background, the site was not evaluated further. Background concentration of metals for Mountain Home AFB was established by collecting and analyzing samples from noncontaminated areas at the Base and using the calculation of 1.5 times the 95% upper confidence level of the mean as the background concentration for a specific metal analyte.

Step 4 of the process evaluated the PCOCs against USEPA Region 3 published Risk Based Concentrations (RBCs). The RBCs are calculated concentrations that consider residential exposure at the 1 in 1,000,000 excess cancer risk for the ingestion route. If

Figure 4
Soils Investigation Approach

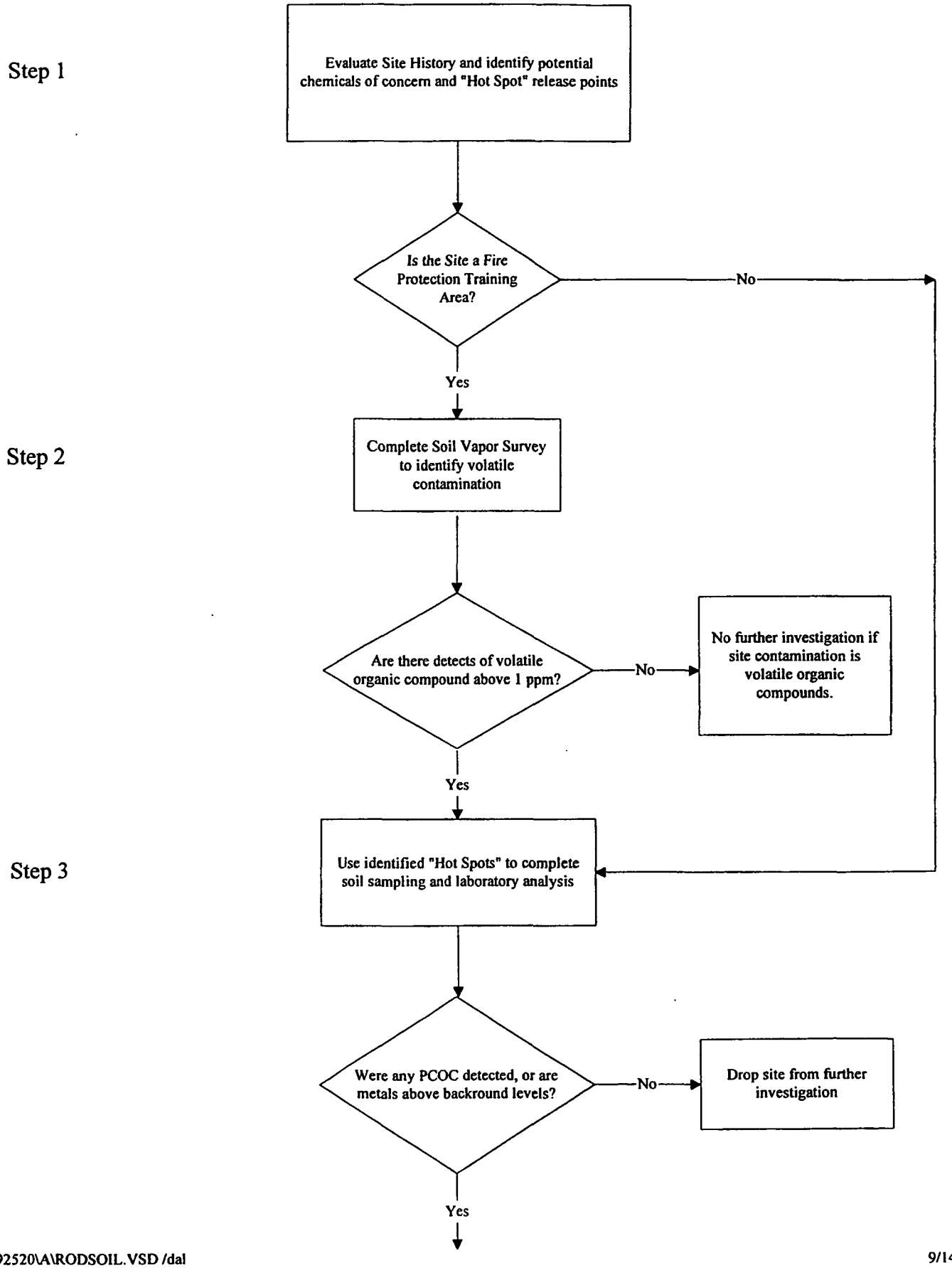
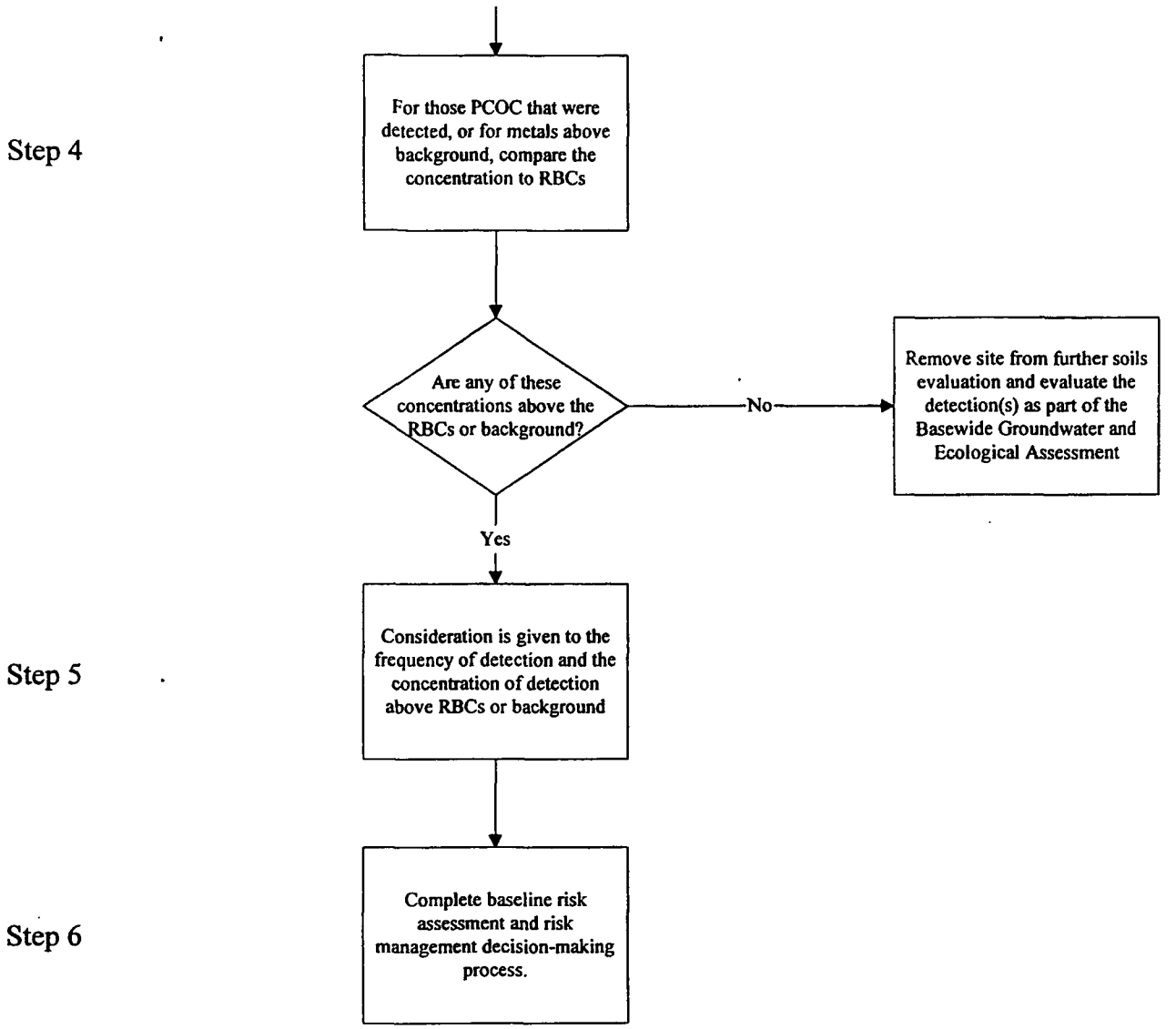


Figure 4
Soil Investigation Approach-Continued



none of the PCOCs were above the published RBCs, the site was removed from further evaluation regarding the soils. However, all the detected PCOCs were further evaluated as part of the Basewide groundwater evaluation and ecological assessment. This was done to be conservative, to consider the mobility of a specific chemical, and to consider the scenario that a given chemical, although below a risk concentration in soil, could be transported to groundwater where it could pose a risk through ingestion. Another consideration was the cumulative potential impacts of detected chemicals in soils on the ecological receptors from the sites.

If the PCOCs were above the RBCs, the site was carried forward to Step 5.

Step 5 of the process evaluated the frequency of detections and the concentration of the detection above the conservative EPA Region 3 RBCs.

Step 6 of the process was to complete the baseline risk assessment and risk management decision-making process considering all aspects of the data and the sites likely future use. The site was then either eliminated from further consideration or evaluated further in the RI/FS process.

The following are the results of the soil investigation.

OU1 and OU6 Sites

DP-09 Waste Oil Disposal Area. Soil samples collected at the site had no detected soil contamination. Therefore, no exposure pathways for soil were evaluated, and the site was removed from further consideration for potential releases to regional groundwater.

DP-18 Old Burial Trench. Four soil samples were collected at 15 test pits at the site. The compound 1,2-dichloroethane was detected at 4 μg/kg, but this maximum concentration was 3 orders of magnitude less than EPA Region 3 RBCs. Therefore, no exposure pathways for soil were evaluated, and the site was removed from further consideration for potential releases to regional groundwater because no evidence of the past site disposal activity was observed and the one chemical detection mentioned is likely due to laboratory contamination and not site related.

FT-04 Fire Training Area 4. Soil gas samples were collected at 49 sampling points, and they were analyzed for total volatile organic compounds (TVOCs) and for total benzene, toluene, ethylbenzene, and xylenes (BTEX) using a field gas chromatograph. All samples were below the 1 ppm TVOCs' screening level criteria. Therefore, no exposure pathways for soil were evaluated, and the site was removed from further consideration for potential releases to regional groundwater.

FT-05 Fire Training Area 5. Soil gas samples were collected at 9 sampling points, and they did not detect TVOCs or BTEX above the 1 ppm screening level criteria. Therefore, no exposure pathways for soil were evaluated, and the site was removed from further consideration for potential releases to regional groundwater.

FT-06 Fire Training Area 6. Soil gas samples were collected at 32 sampling points. At one sampling point, TVOCs were detected above the 1 ppm screening level; however, all of the other sampling points were below the screening-level criteria. Therefore, no exposure pathways for soil were evaluated, and the site was removed from further consideration for potential releases to regional groundwater.

FT-07A Fire Training Area 7A. Soil gas samples were collected at 43 sampling points, and they did not detect TVOCs above the 1 ppm screening-level criteria concentration. Therefore, no exposure pathways for soil were evaluated, and the site was removed from further consideration for potential releases to regional groundwater.

FT-07B Fire Training Area 7B. Soil gas samples were collected at 45 sampling points. TVOCs exceeded the 1 ppm screening-level criteria at some locations. Soil samples were collected from 2 soil borings that were completed in "hot spot" areas identified by the soil gas sampling. Soil samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), total recoverable petroleum hydrocarbons (TRPH), and metals. Chemicals detected in soil samples included VOCs, SVOCs (no PAHs), TRPH, and metals. Several VOCs including solvents and fuel constituents were detected in concentrations below their EPA Region 3 RBCs. Therefore, no exposure pathways for soil were evaluated. Because VOCs were detected, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

FT-07C Fire Training Area 7C. Soil gas samples were collected at 55 sampling points. TVOCs exceeded the 1 ppm screening level at several sample locations. Soil samples were

collected from 2 soil borings that were completed in "hot spot" areas identified by the soil gas sampling. Soil samples were analyzed for VOCs, SVOCs, TRPH, and metals. Chemicals detected in soil samples included VOCs, metals, and TRPH. The maximum concentrations of VOCs and TRPH were toluene at 37 μg/kg and TRPH at 2640 mg/kg. VOCs were detected below their EPA Region 3 RBCs. Therefore, no exposure pathways for soil were evaluated. Because VOCs were detected, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

LF-03 Existing Landfill. Review of site operational procedures and records indicated that hazardous wastes are not and have not been disposed at this site. Therefore, no sampling was done at the site under CERCLA. No exposure pathways for soil were considered, and the site was not evaluated for exposures via the groundwater pathway. The site is currently operating under State landfill regulations.

LF-23 Solid Waste Disposal Area. Twelve soil samples were collected at this site (1 each at 12 test pits), and they were analyzed for VOCs, SVOCs and metals. Several SVOCs (all polyaromatic hydrocarbons [PAHs]) were detected at 2 sample locations in concentrations slightly (less than 1 order of magnitude) above their EPA Region 3 RBCs. The compounds and concentrations that exceeded EPA Region 3 RBCs were benzo(a)anthracene (1,700 μg/kg), benzo(b)fluoranthene (1,700 μg/kg), benzo(k)fluoranthene (830 μg/kg), benzo(a)pyrene (130 μg/kg), and indeno(1,2,3-cd)pyrene (650 μg/kg). These concentrations are at the low end of the range of concentrations (slightly about 10^{-6} threshold to excess cancer risk of a residential scenario for ingestion) for EPA's target risk range for cleanup at Superfund sites. No quantitative evaluations of exposure pathways for soil were considered. The mobility of PAHs in the soil-water system is considered to be low, so the site was not evaluated for exposures via the groundwater pathway.

OT-10 Perimeter Road. Sixteen soil samples were collected from 16 soil borings (1 per boring) along the centerline and the edge of the road. Samples were analyzed for VOCs, SVOCs, TRPH and metals. Several VOCs (e.g., 1,1-dichloroethane and 1,2-dichloroethane) and several SVOCs (e.g., 4-nitrophenol and di-n-octylphthalate [a possible laboratory contaminant]) were detected at several sample locations. The highest VOC and SVOC concentrations were 1,1-dichloroethane at 4.4 μg/kg and benzoic acid at 120 μg/kg, respectively. All detected concentrations were 2 to 3 orders of magnitude less than compound-specific EPA Region 3 RBCs. Therefore, no exposure pathways for soil were considered. Because several organic compounds were detected and

because some of these compounds are known to be mobile in the soil-water system, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

OT-15 Corker Material Burial Area. Thirteen soil samples were collected from 3 soil borings drilled at this site. All samples were analyzed for the element boron, the only potential chemical of concern known to have been disposed at the site. Boron was not detected in any of the samples, and the sample detection limit for all samples was several orders of magnitude less than the EPA Region 3 RBC for boron. Therefore, no exposure pathways for soil were considered, and the site was not evaluated for exposure via the groundwater pathway.

SS-26 Drum Accumulation Pad Near Building 208. Eight soil samples were collected from 4 soil borings (2 per boring), and they were screened for VOCs (the only potential compounds of concern known to have been temporarily stored at the site) by headspace analysis using a photoionization detector. No headspace readings were above background readings. Therefore, no exposure pathways for soil were considered. Because of the possibility that liquid wastes may have been accidentally released to soils in the past, the site was evaluated for exposure via the groundwater pathway using fate and transport modeling.

SS-28 Wash Water Accumulation Basin. Four soil samples were collected from 2 soil borings (2 per boring), and they were analyzed for VOCs, SVOCs, TRPH and metals. Two VOCs, trichloroethene (TCE) (17 μg/kg) and methylene chloride (5.3 μg/kg) (a possible laboratory contaminant) were detected in 2 of the 4 samples. The concentrations of both VOCs were several orders of magnitude below the EPA Region 3 RBCs; therefore, no exposure pathways for soil were considered. Because VOCs were detected and because an applied-water driving-force existed at the site in the past, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

SS-30 DRMO Storage Area. Four soil samples were collected from 2 soil borings (2 per boring), and they were analyzed for VOCs, SVOCs, pesticides/PCBs, herbicides and metals. Several VOCs (ethylbenzene 2 μg/kg, TCE 4 μg/kg, toluene 17 μg/kg, xylenes 5.4 μg/kg, styrene 1.5 μg/kg, and benzoic acid 5 μg/kg) were detected in several of the soil samples. The concentrations of all VOCs were several orders of magnitude below their RBCs; therefore, no exposure pathways for soil were considered. Because VOCs were detected and because liquid wastes may have been accidentally released to soils in the past, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

ST-13 Former USTs at the POL Yard. Soil samples collected before and during the UST removal at this site indicated that soil contained several VOCs. Because contaminated soils were removed and because the site was closed under RCRA (including a RCRA cap), no exposure pathways for soil were considered. Since liquid wastes may have been accidently released from the USTs, the site was evaluated for exposures via the groundwater pathway by fate and transport modeling. A 50-foot rock core was completed 60 feet east of the site to evaluate penetration of liquid fuels into bedrock. This hole was drilled as part of another investigation and considered here to evaluate the potential of petroleum product for ST-13 to migrate horizontally 50 feet and penetrate bedrock. No evidence of organic contamination was found below 30 feet below ground surface.

ST-22 Titan Missile Maintenance Area. Six soil samples were collected from 6 soil borings (1 per boring), and they were analyzed for VOCs and for hydrogen ion concentration (pH). Several VOCs were detected in several samples. Maximum concentrations were: 1,2-dichloroethane 1.5 μg/kg, methylene chloride 6.5 μg/kg (a possible laboratory contaminant) and acetone 12 μg/kg) (also a possible laboratory contaminant). Maximum concentrations of all VOCs were between 2 to 6 orders of magnitude below their respective EPA Region 3 RBCs; therefore, no exposure pathways for soil were considered. Because VOCs were detected and because liquid wastes may have been accidentally released to soils in the past, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

SD-12 Entomology Shop Yard. Sixteen soil borings were drilled at this site. Fifty-two samples collected from the soil borings were analyzed for pesticides/PCBs and for chlorinated herbicides. Seventeen samples from the soil borings were analyzed for VOCs, SVOCs, and metals. Twenty-three samples from the soil borings were analyzed for TRPH. Two discrete surface soil samples were analyzed for metals. A number of VOCs (e.g., chlorobenzene, toluene, trichloroethene, and 1,1-dichloroethene) were all detected at a very low estimated maximum concentration of 2 μg/kg in site soils. Very low concentrations of SVOCs (e.g., less than 50 μg/kg of benzo(b)fluoranthene, benzo(k)fluoranthene, diethylphthalate, fluoranthene, and pyrene) were detected in samples from 4 soil borings. Only one metal, lead, was detected, and it was detected only in one surface soil sample at 32.2 μg/kg, which is slightly greater than background concentration. Herbicides and pesticides (e.g., MCPA, MCPP, alpha-chlordane, dieldrin, gamma-chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, gamma-BHC, heptachlor, and aldrin) were detected in the highest concentrations at 4,000 μg/kg, 200,000 μg/kg, 1,300 μg/kg, 2,900 μg/kg, 1,200 μg/kg, 1,200 μg/kg, 230 μg/kg, 2,700 μg/kg, 1.1 μg/kg, 280 μg/kg, and 120 μg/kg,

respectively. The highest concentrations and frequencies of detections occurred northwest of the location of the former site building where rinse water was discharged to soils. Most pesticides and herbicides were detected in surface or shallow subsurface soils. Because numerous compounds were detected in site soils, and many of the detected chemicals were above EPA Region 10 RBCs exposure pathways for soils were considered. Since the former practice of rinse water discharge to soils may have resulted in transport of dissolved contaminants, and because of the potential for chemicals to leach from soils, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling. Note: The investigation was done in 1991 and considered EPA Region 10 RBCs; since that time EPA Region 3 issued updated RBC tables.

SD-24 MWR Auto Hobby Shop. Fifty-one soil gas samples collected at 25 sample locations were analyzed for halogenated compounds (GC calibrated to a TCE standard) and BTEX. Thirty-three soil samples were collected from 17 soil borings, and they were analyzed for VOCs, SVOCs, TRPH, and metals. Results showed a number of VOCs (2-butanone, acetone, methylene chloride [all 3 are possible laboratory contaminants], toluene, TCE, xylenes, 1,2-dichloroethene, and dibromochloromethane) detected in soils. High concentrations (measured or estimated in the range of 20 to 1,000 milligrams per kilogram) of VOCs (TCE, toluene, xylenes and 1,2-dichloroethene) were limited to soils in the immediate vicinity of a former waste collection tank. All other detected VOC concentrations were in the range of a few to a few tens of μg/kg. The highest concentrations of SVOCs (mainly PAHs, benzo(a)anthracene, fluoranthene, and pyrene [all in the range of 45-720 μg/kg]; and phenol and 2,4-dimethylphenol[in the range of 120 to 200 mg/kg]), and TRPH (in the range of 10,000 to 48,000 mg/kg) were also in soils adjacent to the waste collection tank. Slightly elevated concentrations of TRPH, PAHs, and metals (cadmium and lead) were found near the outfalls of 2 oil drainlines. Because elevated concentrations of VOCs, SVOCs, TRPH, and metals were found in site soils and many of the detected chemicals were above EPA Region 10 RBCs, exposure pathways for soils were considered. Since contaminated soils found near the waste collection tank were likely caused by leakage from the tank, and because of the potential for chemicals to be leached from soils, the site was evaluated for exposures via the groundwater pathway using fate and transport modeling.

SD-27 Vehicle Wash Rack. Ten soil samples were collected from ten soil borings at this site. All samples were analyzed for VOCs, SVOCs, TRPH and metals. In addition, 5 of the soil samples were analyzed for pesticides/PCBs. Results show a large number of compounds are present in soil/sediment at the site. VOCs detected include methylene chloride, 2-butanone,

acetone (all three are likely laboratory contaminants), 1,1,1-trichloroethane, carbon disulfide, ethylbenzene, tetrachloroethene, toluene, trichloroethene, and xylenes. Maximum concentrations were for toluene (120 μg/kg) and xylenes (300 μg/kg). All other concentrations were below 25 μg/kg. SVOCs detected include mostly PAH compounds. The four compounds with the highest detected concentrations are: fluoranthene (44 mg/kg), benzo(b)fluoranthene (32 mg/kg), chrysene (19 mg/kg), and benzo(a)pyrene (18 mg/kg). VOC and SVOC concentrations were highest in a short section of the site drainage ditch near its middle part. TRPH concentrations (maximum of 9,230 mg/kg) were highest in a small area near a lubricant dispensing area. A number of pesticides (heptachlor epoxide, dieldrin, 4,4′-DDD, endrin, 4,4′-DDE, 4,4′-DDT, methoxy chlordane, alpha-chlordane, and gamma-chlordane) were found in samples from the ditch. Maximum concentrations ranged from 10 μg/kg (4,4′-DDT) to 130 μg/kg (4,4′-DDD). Five metals were found at elevated concentrations in samples from the ditch and from near the lubricant dispensing area: barium (1,570 mg/kg maximum), cadmium (5.2 mg/kg maximum), chromium (99.1 mg/kg maximum), lead (161 mg/kg maximum), and zinc (329 mg/kg maximum). Because of the elevated concentrations of the compounds in site soils and many of the detected chemicals were above EPA Region 10 RBCs the site was evaluated for exposure pathways for soil. Since the ditch receives wash water, and because of the potential for chemicals to leach from soil, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

SS-29 Drum Accumulation Pad. Seventeen soil samples were collected from eight soil borings. All samples were analyzed for VOCs, SVOCs, TRPH, and metals. Results showed VOCs (2-butanone), methylene chloride [both are likely laboratory contaminants], toluene, xylenes, 1,1-dichloroethane, 1,1,1-trichloroethane, TCE, and tetrachloroethene). VOC concentrations were low (maximum of 31 μg/kg for 1,1,1-trichloroethane). A large number of SVOCs were detected, and most were PAHs. The four SVOCs with the highest detected concentrations are fluoranthene (54 mg/kg), benzo(b)fluoranthene (53 mg/kg), pyrene (46 mg/kg), and chrysene (23 mg/kg). The maximum TRPH concentration was 10,800 mg/kg. Several metals were detected in elevated concentrations: barium (4,270 mg/kg maximum, cadmium (748 mg/kg maximum), chromium (117 mg/kg maximum), lead (369 mg/kg maximum), and zinc (471 mg/kg maximum). Maximum concentrations of all compounds were restricted to a small area adjacent to the northwest and southwest sides of the concrete pad at the site. Because of the elevated concentrations of the compounds in site soils and many of the detected chemicals were above EPA Region 10 RBCs, the site was evaluated for exposure pathways for soil. Since liquid wastes may have been released at the site in the past, and because of the potential for chemicals to leach from soils, the

site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

OT-16 Munitions Disposal Area. Eight surface soil samples were collected, and they were analyzed for explosives and metals. Twelve subsurface soil samples were collected from two soil borings and three test pits. Subsurface soil samples were analyzed for VOCs, SVOCs, pesticides/ PCBs, TRPH, and metals. In addition, the samples from the test pits were analyzed for explosives. Results show that low concentrations (2 to 15 μg/kg) of VOCs (2-butanone), acetone, methylene chloride [all three likely laboratory contaminants], and toluene) were detected in site soils. Relatively high concentrations (maximums from 99 to 3,200 μg/kg) of several PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, chrysene, fluoranthene, indeno[1,2,3-cd]pyrene, and pyrene) were detected at the burn pit, and they are likely associated with past burning activities. Because of the elevated concentrations of the compounds in site soils and many of the detected chemicals were above EPA Region 10 RBCs, the site was evaluated for exposure pathways for soil. Owing to the potential for chemicals to leach from soils, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

FT08-UST, UST at Fire Training Area 8. The tank sludge was sampled for flash-point analysis, total organic halide, and metals to insure proper disposal procedures were followed for the sludge. After removal of the UST, three soil samples were collected from the bottom of the excavation, and they were analyzed for VOCs, SVOCs, pesticides/PCBs, and TRPH. Only one compound, the VOC methylene chloride, was detected (1 to 2 μg/kg). This compound is a common laboratory contaminant, and it is not believed to be related to site activities. The detected concentrations are well below the compound's EPA Region 3 RBC. Therefore, no consideration of exposure pathways for soil were considered. Because of the possibility (although believed to be remote) that a release of liquid waste may have occurred from the UST and may have gone undetected, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

Fuel Sites

ST-11 Flight Line Fuel Spill. Ninety-nine soil gas samples were collected at 38 sample locations. Samples were analyzed for total volatile hydrocarbons (TVHC) and BTEX using a field gas chromatograph (GC). Results were used to select locations for 14 soil borings. Seventy-six soil samples collected from the soil borings were screened in the field using

headspace analysis, and fourteen of these samples (1 per boring) were also screened using immunoassay analysis. Fourteen soil samples (1 per boring) were analyzed for BTEX, total gasoline range organics (GRO), and lead.

Fifty-four soil or rock samples from the rock cores were screened by headspace analysis, and 14 of these samples were also screened by immunoassay analysis. Results showed fuel contamination of benzene, toluene, ethylbenzene, and xylenes was present at the site. The maximum detected concentrations of these contaminants are 15 mg/kg, 42 mg/kg, 60 mg/kg and 400 mg/kg, respectively. Benzene was in concentrations above EPA Region 3 RBCs in soils near the release point and along the fuel pipeline; therefore, exposure pathways for soils were considered.

ST-31 BX Service Station. Fifty-five soil gas samples were collected at 20 sample locations. Samples were analyzed for TVHC and BTEX. Results were used to select locations for 8 soil borings. Forty-nine soil samples collected from the soil borings were screened using headspace analysis. Sixteen of these samples (2 per boring) were analyzed for BTEX, GRO, TCO and lead. Two rock cores were drilled into bedrock beneath site soils. Head space readings were taken on rock samples from both rock cores, and 2 samples (top and bottom) were collected from a granular interbed (soil material) encountered between 53 to 58 below ground surface in the deeper of the 2 rock cores. The interbed samples were analyzed for BTEX and GRO. Four samples of bedrock from the shallower of the two rock cores were analyed using immunoassay techniques. Only the deepest interval in this rock core had results above the detection limit of 15 ppm. This result was greater than 15 and less than 1,000 ppm for a sample from 28.5 feet below ground surface. The results showed that residual gasoline contamination (benzene, toluene, ethylbenzene, and xylenes) exists in site soils at maximum concentrations of 85.3 mg/kg, 644 mg/kg, 194 mg/kg, and 1,315 mg/kg, respectively, mainly at the bottom of the site UST excavation and in soils at the northeast end of the excavation. Benzene was in a concentration above the EPA Region 3 RBCs. For this reason, exposure pathways for soil were considered. The samples from the interbed below the site were nondetect for fuel constituents; therefore, it is unlikely that fuel has migrated to depth beneath the site. Because of the potential that fuels may have migrated to depth somewhere other than the location of the rock core and because of the potential for fuel constituents to be leached from soils, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

ST-32 MX Service Station. Fifty-six soil gas samples were collected at 21 sample locations. Samples were analyzed for Total Volatile Hydrocarbons (TVHC). Results were used to select locations for 10 soil borings. One hundred and thirteen soil samples collected from the soil borings were screened using headspace analysis. Twenty of these samples (2 per boring) were analyzed for BTEX, Gasoline Range Organics (GRO), and Total Chromatographic Organics (TCO), and lead. Two rock cores were drilled into bedrock beneath site soils. Headspace readings were taken on samples from both rock cores, and samples from a granular zone at 154 feet below ground surface in the deeper of the 2 rock cores was analyzed for BTEX, GRO, TCO and gasoline range petroleum hydrocarbons immunoassay. The results showed residual fuel contamination (benzene, toluene, ethylbenzene, and xylenes) is present at maximum concentrations of 1.8 mg/kg, 69.9 mg/kg, 48.6 mg/kg, and 474 mg/kg, respectively, in soils under the east end of the old pump island pad and underneath the excavations where the former USTs were removed. These levels are below the EPA Region 3 RBCs. However, to be conservative, exposure pathways for soils were considered. Headspace readings and analytical results for samples from the rock cores suggest that it is unlikely that bulk fuels migrated to depth beneath the site. Because of the potential that fuels may have migrated to depth somewhere other than the location of the deep rock core and because of the potential for fuel constituents to be leached from soils, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

ST-34 Fuel Hydrant No. 9. Sixty soil gas samples were collected at 20 sample locations. Samples were analyzed for TVHC and BTEX. Results were used to select locations for 4 soil borings. Twenty-two samples collected from the soil borings were screened using headspace analysis, and 4 of these (1 from the bottom of each boring) were further screened using immunoassay analysis. Four of the 22 soil samples (1 per boring) were analyzed for BTEX and GRO. Fuel constituents (toluene, ethylbenzene and xylenes) were detected in only 1 of the 4 soil samples at a maximum concentration of 10.7 mg/kg, 7.5 mg/kg, and 139.2 mg/kg, respectively, the one collected near the former metering pit. These concentrations are below the EPA Region 3 RBCs. Because fuel-related compounds were detected, exposure pathways for soils were considered. Soil sampling indicated that it was unlikely that bulk fuels had migrated through soil to bedrock; however, because of the potential that such migration had occurred and because of the potential for fuel constituents to be leached from soils, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

ST-35 Hospital Fuel Spill. Two soil borings were drilled at this site. Their locations were based on records and interview information about the location of the fuel release. Eight samples collected from the soil borings were screened using headspace analysis, and 2 of these samples (1 from the bottom of each boring) were further screened using immunoassay analysis. All screening analyses were nondetect. Since no evidence of contamination was found, no further evaluation of the site was done.

OU5 Sites

RW-14 Low Level Radioactive Waste Container Storage Area. Investigation and source removal actions done for RW-14 indicate that no radioactivity above naturally occurring background levels exists in the site soils or air. Since the source was removed and no contamination was detected, no further evaluation of the site was done.

Landfill #1

Lagoon Landfill LF-01 was investigated as part of OU2. During this investigation, soil, groundwater, surface water, sediment, and bedrock samples were taken. The results of analyzing soil, perched groundwater, and regional groundwater for VOCs, SVOCs, pesticides, PCBs, herbicides, metals, and TPH revealed little or no evidence of contamination. Sediment and wastewater samples indicated the presence of contamination. Sediment contained 6 VOCs, 5 SVOCs, DDT, DDD, DDE, alpha- and gamma-chlordane, heptachlor epoxide, Aroclor 1254, cadmium, copper, lead, mercury, silver, and zinc. In the Baseline Risk Assessment, it was concluded that there is no unacceptable risk to human health or ecological receptors from soil, sediment, or wastewater exposure pathways. However, it was unclear how groundwater is effected by the contaminants found at LF-01. For this reason, LF-01 groundwater is included in OU3 Basewide groundwater. Results and recommendations for OU3 include the groundwater influenced by LF-01.

2. Surface Water and Sediment

Surface water and sediment were sampled and considered at sites SD-25 and LF-01 where surface water and sediment occur. Sediment was sampled at site SD-27; no surface water was present.

SD-25 Flight Line Storm Drain. Sixteen sediment samples were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, TRPH, and metals (one soil sample was collected from a soil boring with no detected chemicals). Four surface water samples were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, TRPH, and metals. Results show that only very low concentrations of several VOCs (benzene, 0.24 μg/L; bromodichloromethane, 1 μg/L; dibromochloromethane, 3 μg/L; toluene, 2 μg/L; TCE, 0.2 μg/L; and xylenes, 4 μg/L) and SVOCs (2-methylnaphthalene, 2 μg/L; 4-methylphenol, 27 μg/L; naphthalene, 2 μg/L; pentachlorophenol, 4 μg/L; and phenol, 8 μg/L) were present in surface water. None of these concentrations exceeded Federal Water Quality criteria.

A large number of compounds were detected in the sediment samples. The 4 VOCs with the greatest maximum concentrations were xylenes (2,500 μg/kg), chlorobenzene (890 μg/kg), 1,2-dichloroethene (470 μg/kg) and ethylbenzene (400 μg/kg). All other VOCs were present in maximum concentrations of 2 to 71 μg/kg. The 4 SVOCs with the greatest maximum concentrations were the PAHs, fluoranthene (26 mg/kg), pyrene (19 mg/kg), benzo(b)fluoranthene (16 mg/kg), and chrysene (10 mg/kg). The maximum TRPH concentration was 20.1 mg/kg. The highest VOC, SVOC, and TRPH concentrations were in sediment samples collected from a short length of the storm drain where the outfalls of several drains from industrial facilities enter the storm drain. Two PCB compounds were also detected in this area (Aroclor-1254, maximum concentration of 1,800 μg/kg, and Aroclor-1260, maximum concentration of 1,300 μg/kg). A number of pesticides (alpha-chlordane, beta-BHC, dieldrin, gamma-chlordane, heptachlor, heptachlor epoxide, 4,4′-DDD, 4,4′-DDE, and 4,4′-DDT) were found along the entire length of the drain in maximum concentrations that ranged from 3 to 650 μg/kg. Four metals were found throughout the drain at elevated concentrations, cadmium (47 mg/kg maximum), chromium (231 mg/kg maximum), lead (998 mg/kg maximum), and zinc (559 mg/kg maximum).

Elevated concentrations of the compounds were detected in sediment and surface at the site with many of the detected compounds above conservative Region 10 RBCs. Therefore, the site was evaluated for sediment and surface water exposure pathways. Because the drain contains areas of standing water and because chemicals can be leached from soil/sediment, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

SD-27 Vehicle Washrack Drainage Ditch. A total of 6 sediment samples were collected at this site during the site investigations. Sediment samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, and TRPH. Several VOCs, SVOCs, pesticides/PCBs, metals, and TRPH

were found in the site ditch sediments. VOCs detected included toluene, xylenes, ethylbenzene, 1,1,1-trichloroethane, carbon disulfides, PCE, and TCE. Concentrations ranged from a low of 2 μg/kg for toluene, PCE, and TCE to a high of 300 μg/kg for xylenes.

Several non-PAH SVOCs were reported in these sediment samples including dibenzofuran, carbazole, and 4-methylphenol. Concentrations ranged from dibenzofuran at 73 μg/kg to carbazole at 2,900 μg/kg. High levels of total PAHs were reported in these samples ranging from total concentrations of 1,706 μg/kg to 212,000 μg/kg. Several pesticides/PCBs, including DDE, DDD, DDT, endrin, methoxychlor, endosulfan-sulfate, alpha-chlordane, and gamma-chlordane were detected at two sediment sampling locations. Concentrations ranged from 15 μg/kg of gamma-chlordane to 200 μg/kg of methoxychlor. TRPH was detected in all of the ditch sediment samples at concentrations ranging from 82.3 mg/kg to 3,050 mg/kg. Metals detected above calculated background concentrations, included arsenic, chromium, cadmium, lead, mercury, and zinc. Due to concentrations of chemicals detected in site sediment, and many of the detected compounds were above the Region 10 RBCs, the site was evaluated for sediment exposure pathways. Because chemicals can be leached from the sediment, the site was evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

LF-01 Lagoon Landfill. Sediment and wastewater samples collected during the RI indicated the presence of contamination. Sediment contained 6 VOCs ranging from 11 μg/kg (xylenes) to 168 μg/kg (acetone); 5 SVOCs ranging from 5,300 μg/kg bis(2-ethylhexyl)phthalate to 6,200 μg/kg of pyrene, fluoranthene, benzo(k)fluoranthene, and di-n-butylphthalate; DDT (35,000 μg/kg); DDD (410 μg/kg); DDE (76 μg/kg); alpha- and gamma-chlordane 15 μg/kg and 20 μg/kg); heptachlor epoxide (16 μg/kg); Aroclor 1254 (310 μg/kg); cadmium; copper; lead; mercury; silver; and zinc.

Analytical results for sampling of the lagoons at LF-01 are presented as Tables 1, 2, 3, 4, and 4a shown in Appendix A. Water samples contained 2-butanone and benzene at 5 and 4 μg/L, respectively, and 1,2-dichlorobenzene (5 μg/L), 4-methylphenol (5 μg/L), phenol (5 μg/L), and naphthalene (7μg/L). Because of the detections of chemicals of concern in the site sediment and wastewater and the detections being above Region 10 RBCs, a Baseline Human Health Risk Assessment was completed. In the Baseline Risk Assessment, it was concluded that there is no unacceptable risk to human health or ecological receptors from soil, sediment, or wastewater exposure pathways. However, it was unclear how groundwater is effected by the contaminants found at LF-01. For this reason, the LF-01 groundwater pathway is included in OU3 Basewide

groundwater investigation. Results and recommendations for OU3 include the groundwater influenced by LF-01.

3. Perched Groundwater

Perched groundwater was encountered at sites LF-01 and ST-11.

Perched Groundwater at LF-01. The perched groundwater at LF-01 was encountered in three horizons below the site. None of the layers was continuous. Elevated levels of ions, such as nitrates, were detected in the perched zone at LF-01 in comparison to regional groundwater. The source of the perched water is likely due to water from the lagoons at LF-01, infiltrating through the vadose zone to a semipermeable layer where a perched zone was created. The perched zones are confined mainly to fractured basalt and interflow zones. The exact horizontal extent is not known, but likely is confined to the area directly below the lagoons as evidenced by a dry core hole adjacent to the lagoon. LF-01 perched water is included in this section because it was evaluated for its potential impact to the regional groundwater as part of the OU3 investigations. LF-01 is presented in detail in the OU2 ROD.

Perched Groundwater at ST-11. Eight rock cores were drilled into bedrock beneath site soils, 7 of these encountered perched groundwater, and 5 of these were completed as temporary perched groundwater monitoring wells. Perched groundwater was encountered at about 30 to 40 feet below ground surface.

The perched water zone at ST-11 is confined mainly to a fractured zone in the basalt bedrock. This fractured zone exists immediately above a silty sand layer that was encountered in the rock borings. This silty sand layer was observed to be dry during drilling activities. The lateral extent of the perched water is uncertain, but appears to be at least 250 feet by 500 feet. It is not certain from the data currently available whether the perched water encountered in the different locations at the site is connected and represents a continuous, interconnected perched water layer. However, the perched layer is likely limited in extent and volume. Field tests indicate that both of these zones have limited capacity to be pumped.

Water samples from the 7 perched water cores were analyzed for BTEX, GRO, and total chromatographable organics (TCO). The eighth rock core did not encounter perched water, and it was drilled to 169 feet below ground surface. Maximum detected dissolved fuel constituents

of benzene and xylenes were detected in perched groundwater in concentrations of 7,500 and 440 μg/L, respectively. These are above EPA Region 3 RBCs for water ingestion. The maximum total petroleum hydrocarbon for GRO and TCO was 12,000 mg/L. No RBCs exist for the GRO and TCO analysis. Exposure pathways for perched groundwater were considered. The site was also evaluated for exposures via the regional groundwater pathway using fate and transport modeling.

4. Regional Groundwater

4.1 Pre-RI Investigations

The following is a summary of results from previous studies (results from USGS sampling, Base monitoring of Base production wells, and sampling by the IDHW) on groundwater quality at MHAFB:

- Mobile inorganic chemicals (chloride, sulfate, and nitrite + nitrate nitrogen) associated with infiltrating wastewater at the Base lagoons and with irrigation water applied to the Base golf course have impacted groundwater at the Base.

- The time of travel required for the surface-applied water to reach the water table was apparently short. Chloride concentrations in groundwater sampled at Base production wells located adjacent to the Base golf course began to rise in the late 1950s. The source of chloride may be potassium fertilizers or naturally occurring chloride in site soils). The golf course was completed in 1956.

- A thin perched water zone has developed on top of an interbed several tens of feet above the regional water table and below the wastewater lagoons. Concentrations of inorganic solutes are higher in the perched water when compared to concentrations in the regional aquifer near the lagoons. The inorganic solutes are below MCLs except for nitrate.

- Concentrations of a number of volatile organic compounds (below MCLs) have been detected in Base production wells.

- Trichloroethene (TCE) has been detected in concentrations that are usually below the MCL and are 2 μg/L or less in Base production wells and Base monitoring wells. The source of the TCE appears to be consistent with historical release from an area or areas in the south-central part of the Base. One measurement of TCE was above the 5 μg/L MCL; however, this was from data collected that was not part of this investigation and did not contain proper QA/QC or validation.

- Several compounds that belong to the class of compounds known as trihalomethanes (THMs), including chloroform, bromoform, bromodichloromethane, and chlorodibromomethane, have been detected in Base production wells, but they have not been detected in Base monitoring wells. The source of the THMs may be the chlorination equipment used for the Base water supply system (wellhead chlorination units).

4.2 Remedial Investigation Results

Analytical results from sampling of wells at the Base are presented as Tables 5 through 31 shown in Appendix A. Up to four rounds of groundwater sampling at 8 Base production wells, 18 Base monitoring wells, and 5 off-Base irrigation wells were performed as part of the OU3 RI. Results indicate that TCE was the only CERCLA related contaminant that was consistently detected in several wells; however, all concentrations of TCE except for one sample, were well below (2 μg/L) the MCL of 5 μg/L set by the Safe Drinking Water Act (SDWA). The one sample that had an exceedance of the MCL had a TCE concentration of 14.7 μg/L; however, this sample did not have an approved quality control program, and the result is questionable. In addition to TCE, other volatile organic compounds were also detected in the groundwater at levels below MCLs. Table 32 identifies the chemicals of concern that were detected in the regional groundwater. Table 33 shows the maximum detected concentrations of chemicals that were detected in the regional groundwater.

Many of the metals species detected by the four rounds of groundwater sampling are near apparent background concentrations. The background concentrations for metals were determined by the average concentrations for the upgradient western Snake River Plain regional aquifer, or median concentrations for Elmore County, Idaho. Metals that exceed apparent background conditions for the aquifer are present in concentrations below levels of concern (EPA maximum contaminants levels [MCLs]) except for one detection of cadmium that was slightly above

TABLE 32

CHEMICALS OF CONCERN DETECTED IN GROUNDWATER FROM EITHER BASE PRODUCTION OR MONITORING WELLS

4-Nitrophenol
Acetone
Aluminum
Barium
Benzene
Bis(2-ethylhexyl)phthalate
Bromoform
Cadmium
Chromium
Cobalt
Copper
Di-n-octylphthalate
Lead
Manganese
Mercury
Methylene Chloride
Nickel
Pentachlorophenol
Trichloroethene
Vanadium
Zinc

Note: Zinc does not have EPA-established toxicity factors.

TABLE 33

MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS AT ALL BASE WELLS TO RBCs[1]

Well ID	Chemical	Maximum Detected Concentrations (µg/L)	MCL[5] (µg/L)	RBC[1] (µg/L)
OU3-BPW2-RGW-002	4-Nitrophenol	1	--	2300
OU3-BPW4-RGW-002	Acetone	10	--	3700
OU3-BPW2-RGW-001	Benzene	1.4	5	0.36
OU3-MW6-RGW-001	Bis(2-ethylhexyl)phthalate	120	--	4.8
OU3-BPW4-RGW-001	Bromoform	3	100	2.4
OU3-BPW7-RGW-002	Cadmium	5.2	5	18
OU3-MW8-RGW-002	Chromium	14.7	100	180[2]
OU3-BPW5-RGW-001	Copper	53	1300[6]	1400
OU3-MW1-RGW-004	Di-n-octylphthalate	3	--	730
OU3-BPW9-RGW-001	Lead	7.3	15	15[3]
OU3-MW06-RGW-001	Mercury	0.2	2	11
OU3-MW16-RGW-004	Methylene Chloride	2	--	4.1
OU3-MW17-RGW-002	Nickel	16.3	100	730
OU3-BPW9-RGW-001	Pentachlorophenol	0.65	1	0.56
OU3-BPW1-RGW-004 and OU3-BPW9-RGW-001	Trichloroethene	3	5	1.6
OU3-BPW9-RGW-001	Zinc	840	--	NA

[1] RBC is the EPA Region III risk-based concentration for residential tap water based on a 10^{-6} excess cancer risk level and a Hazard Quotient of 1 for noncancer effects (EPA 19

[2] RBC is for chromium VI and compounds

[3] No Region III RBC available for lead. Value is the action level defined in the May 1993 Drinking Water Regulation and Health Advisory (EPA 1993).

[4] Estimated risk at maximum detected concentration based on RBC comparison. Risk = (maximum conc. / RBC) * 1 x 10^{-6}

[5] EPA maximum contaminant level

[6] EPA action level

NA = RBC not available because there are no EPA-established toxicity factors for this compound.

Note: No noncarcinogens exceeded RBCs; therefore, no total Hazard Index was calculated.

(5.2 μg/L versus 5.0 μg/L). This concentration is still below the conservative EPA Region 3 RBC for water ingestion. Background concentrations for metals are shown in Table 34.

G. GROUNDWATER MODELING RESULTS

Fate and transport modeling was used to identify sites that may have in the past, are currently, or may in the future release COCs to the regional groundwater aquifer. Table 35 lists the COCs and the sites where the COC was modeled. The concentrations used in the modeling were the maximum detected for a site. The modeled concentrations in groundwater were compared to MCLs and EPA Region 3 health risk-based concentrations (RBCs) for groundwater ingestion. The models used are highly conservative and would tend to overestimate actual chemical concentrations. The EPA Region 3 RBCs are conservative criteria that consider ingestion of groundwater under a residential scenario.

Where high degrees of uncertainty existed with regard to model parameters, the fate and transport modeling used conservative assumptions regarding factors such as source concentrations, infiltration rates, vadose zone transport parameters, and degradation rates. When the net impact of all model parameter and assumption uncertainty is considered, the probability is high that the model could be expected to significantly overestimate potential groundwater concentrations of COCs.

The method used to calculate the peak 30-year average exposure point concentrations includes peak concentrations from past years before current or future exposures could occur. This approach is likely to significantly overestimate potential exposure point concentrations.

Table 36 shows the analytes and the sites where modeled results exceeded MCLs or RBCs. The modeled concentrations given in Table 36 are the peak 30-year average concentrations that are estimated to occur at the location of the model-predicted present-day peak concentration in groundwater. That is, the fate and transport model was used to predict the location in the groundwater of the highest concentration of each analyte from each source area. The model was then used to predict the 30 highest consecutive annual concentrations at this location. The average of these 30 concentrations was then considered to be the reasonable maximum exposure concentration for a residential receptor.

TABLE 34

CONCENTRATIONS OF DISSOLVED METALS (BACKGROUND) IN GROUNDWATER IN WELLS IN ELMORE COUNTY, IDAHO (µg/L)

Location	Date	Al	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Li	Mn	Mo	Sr	V	Zn
5S-8E-34BDC2	9/12/80	-	10	-	-	140	-	-	-	-	150	-	40	160	-	-	-	4
5S-10E-30CAC1	9/15/80	-	3	-	-	60	-	-	-	-	30	-	600	1	-	-	-	130
5S-7E-24DDD1	9/12/80	-	7	-	-	110	-	-	-	-	30	-	60	140	-	-	-	100
5S-6E-16DBD1S	9/23/90	-	5	-	-	60	-	-	-	-	<10	-	10	<1	-	-	-	<3
4S-3E-35BCA1	8/19/80	-	18	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
4S-2E-25DAD1	9/24/80	-	7	-	-	120	-	-	-	-	<10	-	60	<1	-	-	-	490
4S-5E-25BBC1	6/2/81	10	-	10	<1	-	<1	ND	<3	<10	<10	<10	7	<1	<10	45	23	<3
4S-9E-3DCA1	9/10/80	-	6	-	-	30	-	-	-	-	10	-	10	<1	-	-	-	40
4S-6E-2DAA1	5/27/81	10	-	7	<1	-	<1	ND	<3	<10	<10	<10	<4	1	<10	62	11	41
3S-6E-14CDA1	11/21/80	-	5	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
3S-7E-8CAA1	5/21/81	10	-	9	<1	-	<1	1	<3	<10	<10	<10	<4	<1	<10	51	13	10

Source: Wood and Low (1988)
Note: - = data not available
ND = nondetect

TABLE 35

CHEMICALS OF CONCERN IN GROUNDWATER BASED ON FATE AND TRANSPORT MODELING RESULTS[a]

Chemical of Concern	Site Where Detected in Soil
Arsenic	Landfill 2 (LF-02)
Trichloroethene	Fire Training Area 7B (FT-07B)
1,1,2-Trichloroethane	Fire Training Area 7B (FT-07B)
Chloroform	Fire Training Area 7B (FT-07B)
Trichloroethene	Fire Training Area 7C (FT-07C)
Chloroform	Fire Training Area 7C (FT-07C)
Trichloroethene	Fire Training Area 8 (FT-08)

[a] Chemicals of concern selected based on results of fate and transport modeling. Only trichloroethene has been detected in groundwater on the Base.

TABLE 36

MODEL-ESTIMATED PEAK 30-YEAR AVERAGE CONCENTRATIONS COMPARED TO EPA REGION III RBCs[a]

Site	Chemical	Peak 30-Year Average Concentration (μg/L)[b]	Region III 10^{-6} RBC (μg/L)	Region III 10^{-4} RBC (μg/L)	MCL[c] (μg/L)	Predicted Cancer Risk Level[d]
LF-02	Arsenic	14[e]	0.038	3.8	50	3.7×10^{-4}
FT-07B	Trichloroethene	9.4	1.6	160	5	5.9×10^{-6}
	1,1,2-Trichloroethane	3.7	0.19	19	5	1.9×10^{-5}
	Chloroform	2	0.15	15	100	1.3×10^{-5}
						3.8×10^{-5}[f]
FT-07C	Trichloroethene	4.9	1.6	160	5	3.1×10^{-6}
	Chloroform	0.6	0.15	15	100	4.0×10^{-6}
						7×10^{-6}[g]
FT-08	Trichloroethene	1.7	1.6	160	5	1.1×10^{-6}

[a] EPA Region III RBCs (EPA 1994)
[b] Peak 30-year average concentration based on results of fate and transport modeling (see Sections 8.0 and 9.0)
[c] Maximum Contaminant Level from December 1993 Drinking Water Regulations and Health Advisories (EPA 1993)
[d] Predicted cancer risk level based on $\text{Risk} = \left(\frac{\text{conc.}}{\text{RBC}}\right) * 1 \times 10^{-6}$
[e] Arsenic concentration modeled to groundwater at center of LF-02 (14 μg/L). Quoted exposure point concentration at edge of Landfill 2 is expected to be lower by a factor of 10 to 100, and resulting risks will be lower by the same factor (see text).
[f] Total cancer risk for FT-07B
[g] Total cancer risk for FT-07C

Note: Predicted cancer risk levels for FT-07B, FT-07C and FT-08 are for contaminants predicted by fate and transport modeling to be present in groundwater. Predicted cancer risk level for LF-02 is for a contaminant predicted by fate and transport modeling to reach the groundwater over 6,000 years in the future.

This is a very conservative approach because some of the years with the highest predicted concentrations occurred in the past. As a result, the modeling is likely to overestimate the actual condition. This conservatism was built into the model to offset uncertainties in other components of the modeling.

The modeled concentration of arsenic in groundwater was 14 μg/L, which is below the MCL (50 mg/L) (expected to reach regional groundwater in 6,000 years). This concentration exceeds the Region 3 RBCs by a factor of 370. The modeling results indicated that TCE and two inorganic compounds may reach the aquifer at levels slightly above safe drinking water standards. As noted, the model used conservative assumptions. As a result, the modeling is likely to overestimate the actual condition. The model-estimated concentration of trichloroethene (9.4 μg/L) exceeded the MCL (5 μg/L). The model-estimated concentrations of all other analytes were below the respective MCLs.

For Site ST-11, benzene, ethylbenzene, toluene, and xylenes were chemicals of concern. Model-estimated concentrations in groundwater from infiltration of perched groundwater at ST-11 of ethylbenzene, toluene, and xylenes were below detectable quantities. The model-estimated concentration of benzene was 0.6 μg/L which is significantly below MCLs.

H. POTENTIALLY EXPOSED POPULATION

MHAFB is likely to remain a military installation in the near future of 30 years. Currently, humans who might be directly exposed to chemicals in the soils at each site are Base employees (occupational receptors) who are assumed to work at the site for 25 years. This is a conservative approach because the standard tour of duty at MHAFB is three years, and because chronic daily exposures do not occur at most sites. However, occupational exposures are the best guide to potential risks likely to occur at the sites under current or future use.

For hypothetical future scenarios, trespassers or recreational receptors (ages 6 to 12 years) are assumed to be exposed to ditch sediments and water; and residents are also assumed to be exposed to the regional groundwater and soil.

VI. SUMMARY OF SITE RISKS

The following section provides an indication of the risks to human health and the environment that are posed by the sites addressed in this ROD. Human health risks are described by discussing the types of contaminants, the exposures including pathways, exposed population, a toxicity assessment, and risk characterization. Environmental risks are addressed for the actual or potential threat to plant and animal species from chemicals released from the sites.

A. HUMAN HEALTH RISKS

1. Contaminant Identification

The media contaminant and concentrations of concern for each site are summarized in the Summary of Site Characteristics section.

2. Exposure Assessment

Exposure Pathways

The exposure pathway evaluated in the quantitative baseline risk assessments are listed below:

Current and Future Base Workers

- Incidental ingestion of soil or sediment
- Inhalation of volatile chemicals and particulate matter released from soil
- Dermal contact with soil or sediment
- Dermal contact with surface water

Note: Exposure to sediment and surface water were at LF-01 and Flight Line Storm Drain.

Future Hypothetical Trespassers (Recreational Users) at Flight Line Storm Drain

- Incidental ingestion of sediment
- Dermal contact with sediment
- Inhalation of volatile chemicals and particulate matter released from sediment
- Dermal contact with surface water

Future Hypothetical On-Site Residents

- Incidental ingestion of soil
- Inhalation of volatile chemicals and particulate matter released from soil
- Dermal contact with soil
- Ingestion of, dermal contact with, and inhalation of volatile emissions from groundwater

Potentially Exposed Population

Current Use Scenario

Base employees (occupational receptors), who are assumed to work at the site 25 years, are the likely population who could be directly exposed to chemicals. The average tour of duty at the Base is three years, and chronic daily exposures do not occur at most sites. Therefore, addressing long-term occupational exposure is a conservative approach. Trespassers were not evaluated because exposures and risks would be lower than for on-site workers.

Future Use Scenario

Humans who might be directly exposed to chemicals at the sites if industrial activities resume would be workers. Hypothetical on-site future residential scenarios were evaluated as a maximum exposure to soils, air, and groundwater. If no unacceptable risks were calculated using the residential scenario, no other scenario was considered because this scenario would show the likely highest potential risk.

Monitoring/Modeling Data and Exposure Point Concentrations

Chemicals evaluated as potential chemicals of concern in the RI, are chemicals that have been released from past disposal practices. Chemicals with EPA-established toxicity factors were evaluated quantitatively in the risk assessment; chemicals without EPA-established toxicity factors were addressed qualitatively. Metals within background level and common laboratory and field contaminants are not potential chemicals of concern. Furthermore, metals that are essential nutrients (e.g., calcium, magnesium, iron, potassium, and sodium) are not considered potential chemicals of concern. The RME metals concentrations in designated background soil samples are shown on Table 37.

The exposure point concentration for soils and sediment used to estimate risks included the arithmetic mean and upper 95 percent upper confidence limit (UCL) on the mean soil and sediment concentrations calculated using sample analytical results for each RI site. The 95 percent UCL concentration accounts for the uncertainty associated with the estimation of the mean, and is used to represent the reasonable maximum exposure (RME) concentrations. If the calculated 95 percent UCL concentration exceeds the maximum detected concentration, the maximum is used for RME concentration. Tables 38 and 39 (shown in Appendix A) summarize the RME concentrations for organic chemicals and metals of concern in soils and sediments, and surface water at Basewide locations.

The exposure point concentration for surface water was the RME calculated for surface water from samples at the Flight Line Storm Drain.

The exposure point concentrations for groundwater are the maximum modeled concentration and the maximum detected concentrations at Base monitoring/production wells.

The exposure point concentration for air emissions was calculated using a screening-level air emission and dispersion model to estimate air concentration due to wind erosion and volatilization of chemicals at each RI site. Airborne emissions from soils resulting from volatilization of volatile organic compounds and emissions of semivolatile compounds, pesticides/PCBs, herbicides, and metals associated with wind erosion of particulate matter (dust) less than 10 microns in diameter were evaluated. RME air concentrations were estimated using reasonable maximum soils concentrations.

TABLE 37

RME METALS CONCENTRATIONS IN DESIGNATED BACKGROUND SOIL SAMPLES (mg/kg)

Analyte	Background Level
Aluminum	23616
Arsenic	4.5
Barium	274
Beryllium	1
Cadmium	<.06
Chromium	21.2
Cobalt	10.3
Copper	20
Lead	17.5
Mercury	0.1
Nickel	22.2
Silver	0
Vanadium	37.4
Zinc	65

Source: W-C 1992a.

3. Toxicity Assessment

The toxicity assessment addresses the potential for a chemical of concern to cause adverse effects in exposed populations and estimates the relationship between extent of exposure and extent of toxic injury (dose-response relationship) for each chemical.

Qualitative and quantitative toxicity information for the chemicals of concern is acquired through evaluation of relevant scientific literature. The most directly relevant data come from studies in humans. However, most of the useable information on the toxic effects of chemicals comes from controlled experiments in animals. The result of toxicity assessments performed by EPA is the development of chemical-specific toxicity factors for the inhalation and oral exposure routes. These toxicity factors are published in the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (EPA 1992).

EPA toxicity factors are used to assess potential health risks resulting from the estimated chemical intakes. Toxicity factors are expressed either as reference doses (RfDs) for noncarcinogenic compounds or cancer slope factors (SFs) for carcinogens. RfDs are used to estimate the potential for noncarcinogenic (toxic) effects of substances. An RfD is the daily dose of a noncarcinogen that is not likely to result in toxic effects to humans over a lifetime of exposure. RfDs are derived from human epidemiological studies or animal studies to which safety factors have been applied (e.g., to account for the use of animal data to predict effects in humans). RfDs are expressed in units of mg chemical/kg body weight/day. Estimated daily chemical doses from exposure to contaminated media are compared to the RfD to estimate the potential for toxic effects.

Slope factors (SFs) have been developed by EPA for estimating excess lifetime cancer risks associated with exposure to potential carcinogens. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated daily dose of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that dose level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal studies, which applies mathematical extrapolation from high doses to low doses (e.g., to account for the use of animal data to predict effects on humans).

4. Risk Characterization

Risk Quantification

The risk characterization combines the outputs of the exposure and toxicity assessments to develop quantitative estimates of health risks associated with the site. Noncarcinogenic health risks are characterized by comparing the estimated daily chemical dose to the RfD. The ratio of the estimated dose to RfD is called the hazard index. Hazard indexes are added together for all chemicals and exposure pathways to yield a total hazard index for the combined exposures. A hazard index equal to or less than 1 indicates that no adverse noncarcinogenic health effects are expected to occur, even to sensitive individuals over a lifetime of exposure.

Carcinogenic health risks are characterized as the excess probability (for example, 1 in 1,000,000) that an individual will develop cancer due to the estimated exposure. Excess probability means the increased risk over and above the normal risk of getting cancer. Cancer risks are calculated by multiplying the estimated daily chemical intake by the chemical-specific cancer slope factor. Cancer risks are calculated separately for each carcinogen and each exposure pathway, and then added together to yield a total upper-bound estimate of cancer risk due to the combined exposures. This is a highly conservative approach, which makes underestimation of the actual cancer risk unlikely.

EPA has established an acceptable target excess cancer risk range of 1×10^{-6} to 1×10^{-4} (1 in 1,000,000 to 1 in 10,000) as guidance for protection of public health from exposure to chemicals released from Superfund sites (EPA 1989). An excess lifetime cancer risk of 1×10^{-4} indicates that an individual has an extra one in ten thousand chance of developing cancer over a lifetime of exposure to site-related carcinogens.

Site-specific average risk estimates were calculated using reasonable best estimates. Site-specific RME and standard default RME risk estimates were calculated using conservative (health-protective) best estimates of probable exposures under various exposure scenarios. Standard default exposure factors were used for most of the sites at MHAFB.

Risk Estimation Using Investigation Results

The maximum detected concentrations of all the COCs in regional groundwater were below the MCLs during the MHAFB OU3 RI. Furthermore, any detected chemical compounds were compared to EPA Region 3's RBCs, and risks associated with these chemicals were calculated using EPA Region 3 RBCs exposure factors, scenario, etc. A total cumulative risk of 3×10^{-5} was estimated for ingestion of regional groundwater. Table 40 compares the maximum detected groundwater concentrations at all Base production wells to EPA Region 3 RBCs.

A number of perched groundwater bodies were found at MHAFB. In the perched water (27 feet bgs) at Site ST-11, the concentration of some volatile chemicals such as benzene, toluene, and ethylbenzene were above MCLs. Using EPA Region 3 RBCs conservative exposure factors, a total risk of 2×10^{-2} was estimated for ingestion of perched groundwater as drinking water. However, as shown in the RI section of this ROD, the contaminants currently present in the perched water at ST-11 do not present an unacceptable risk to the regional groundwater.

Risk Estimation Using Modeling Results

Table 36 shows the results of risk assessment that was performed using 30-year peak modeled concentrations. Only chemicals that exceeded MCLs or Region 3 RBCs were included in the risk evaluation. Arsenic (from LF-2) presents a risk of 3.7×10^{-4}, which exceeds EPA's acceptable risk range of 10^{-6} to 10^{-4} for carcinogens. However, the assumptions that were used for the model were conservative. As a result, the modeled concentrations are likely to overestimate the future condition, and the future risk that is associated with groundwater ingestion. Therefore, no unacceptable human health risks are expected due to exposure to regional Snake River Plain aquifer groundwater at MHAFB.

Uncertainty

Throughout the human health risk assessment, conservative assumptions regarding exposure concentrations, exposure conditions, toxicity, and risk characterization were used that tend to overestimate potential risk. The chief conservative assumptions and other uncertainties affecting the risk assessment are discussed here.

TABLE 40

COMPARISON OF MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS AT ALL BASE WELLS TO RBCs[1]

Well ID	Chemical	Carcinogens?	Maximum Detected Concentrations (µg/L)	MCL[5] (µg/L)	RBC[1] (µg/L)	Exceeds RBC ?	Carcinogenic Risk at Maximum Detected Concentrations[3]
OU3-BPW2-RGW-002	4-Nitrophenol	NO	1	--	2300	NO	
OU3-BPW4-RGW-002	Acetone	NO	10	--	3700	NO	
OU3-BPW2-RGW-001	Benzene	YES	1.4	5	0.36	YES	3.9E-06
OU3-BPW2-RGW-002	Bis(2-ethylhexyl)phthalate	YES	120	--	4.8	YES	2.5E-05
OU3-BPW4-RGW-001	Bromoform	YES	3	100	2.4	YES	1.3E-06
OU3-BPW7-RGW-002	Cadmium	YES	5.2	5	18	NO	2.9E-07
OU3-MW8-RGW-002	Chromium	YES	14.7	100	180[2]	NO	8.2E-08
OU3-BPW5-RGW-001	Copper	NO	53	1300[6]	1400	NO	
OU3-MW1-RGW-004	Di-n-octylphthalate	NO	3	--	730	NO	
OU3-BPW9-RGW-001	Lead	NO	7.3	150[6]	15[3]	NO	
OU3-MW06-RGW-001	Mercury	NO	0.2	2	11	NO	
OU3-MW16-RGW-004	Methylene Chloride	YES	2	--	4.1	NO	4.9E-07
OU3-MW17-RGW-002	Nickel	NO	16.3	100	730	NO	
OU3-BPW9-RGW-001	Pentachlorophenol	YES	0.65	1	0.56	YES	1.2E-06
OU3-BPW1-RGW-004 and OU3-BPW9-RGW-001	Trichloroethene	YES	3	5	1.6	YES	1.9E-06
OU3-BPW9-RGW-001	Zinc	NO	840	--	NA	NA	
						Total Cancer Risk	3.4E-05

[1] RBC is the EPA Region III risk-based concentration for residential tap water based on a 10^{-6} excess cancer risk level and a Hazard Quotient of 1 for noncancer effects (EPA 1994).

[2] No Region III RBC is available for lead. Value is the action level defined in the May 1993 Drinking Water Regulation and Health Advisory (EPA 1993).

[3] Estimated cancer risk at maximum detected concentration based on RBC comparison. Risk = (maximum conc. / RBC) * 1 x 10^{-6}

NA = RBC not available because there are no EPA-established toxicity factors for this compound.

Note: No noncarcinogens exceeded RBCs; therefore, no total Hazard Index was calculated.

- Risk evaluation of groundwater was conservative because EPA Region 3 RBCs were deemed to be conservative.

- Uncertainties are inherent in any modeling effort, and the conservative assumptions used are likely to overestimate the risk to human health in the actual future condition. ST-11 is the only site that would present an unacceptable risk if the perched groundwater were used as a drinking water source in a future residential scenario.

- EPA RfDs used in calculating RBCs are based on conservative estimates of the potential for adverse noncarcinogenic effects. Most RfDs are developed by reducing the dose at which no adverse effects were observed in the most sensitive animal species by uncertainty factors ranging from 10 to 10,000. This extrapolation method provides a considerable level of conservatism in the RfDs used to estimate the potential for noncarcinogenic health effects and could result in an overestimate of potential hazards by several orders of magnitude.

- EPA slope factors used in calculating RBCs are highly conservative estimates of dose-response relationships and probably result in a significant overstatement of actual cancer risk and in very conservative (low) RBCs. Cancer SFs are calculated using the 95 percent UCL on a dose-response curve estimated by a linear mathematical model that extrapolates from short-term, high-dose animal exposures to long-term, low-dose human exposures. EPA guidance states that the cancer SFs are upper-bound estimates of potency, and actual potency is likely to be lower (therefore, RBCs could be higher).

- Zinc was considered a chemical of concern, but it was not evaluated in the quantitative risk assessment because it does not have EPA-established toxicity factors. EPA has established toxicity factors for hundreds of potentially hazardous compounds associated with waste materials, and detected analytes without toxicity factors often have no known adverse affects or data are inadequate for quantitative risk assessment. The exclusion of zinc from the quantitative analysis is not likely to affect the results or conclusions of the risk assessment relative to the chemicals with known toxicities.

- Health risks due to exposures to TPH were not addressed quantitatively in the risk assessment. Exclusion of TPH is expected to have little effect on the risk results because the major toxic constituents of TPH (e.g., benzene, ethylbenzene, toluene, xylene, PAHs) were evaluated quantitatively, and other constituents of TPH are not likely to contribute significantly to health risk.

- Cumulative carcinogenic risks were estimated assuming that effects of individual chemicals are additive. This approach does not account for potential synergism, antagonism, or differences in target-organ specificity and mechanism of action. This approach may over- or underestimate actual health risks.

Summary of Human Health Risks

The following sites had no detected chemicals in soils, and no further action was recommended:

- Waste Oil Disposal Area (DP-09)
- Corker Material Burial Site (OT-15)
- Old Burial Trench (DP-18)
- Fire Training Areas 4, 5, and 7A (FT-04, FT-05, and FT-07A)
- Drum Accumulation Pad Near Building 208 (SS-26)
- Hospital Fuel Spill (ST-35)
- Low-Level Radioactive Waste Container Storage Area (RW-14)
- Underground Storage Tanks at Fire Training Area 8 (FT-08 UST)

For sites that had detectable levels of contaminants present in soil and/or sediment and/or surface water, degree of risk associated with ingestion, inhalation, and dermal contact of contaminated media was characterized in the risk assessment. Potential risks were calculated for present and future occupational exposures and for hypothetical future residential exposures. According to the risk assessments, the following sites presented no unacceptable risks.

- Old Entomology Shop (SD-12)
- Former Auto Hobby Shop (SD-24)
- Flight Line Storm Drain (SD-25)
- Munitions Disposal Area (OT-16)

- Flight line Fuel Spill (ST-11)
- BX Service Station (ST-31)
- Fuel Hydrant #9 (ST-34)

The following sites showed some potential for health risks under certain conservative exposure scenarios. The vehicle wash rack (SD-27) and the drum accumulation pad (SS-29) showed cancer risks of 3×10^{-4} and 2×10^{-4}, respectively, for hypothetical future residential exposures. However, as discussed in the OU-6 RI, both of these sites are quite small (e.g., 20 x 20 feet) making any significant exposure unlikely, and residential development at these sites is unlikely. Therefore, the risks due to residential exposures are likely overestimated. No unacceptable risks were calculated for occupational exposures; therefore, no unacceptable risks are expected for likely exposures at these sites.

The MX (ST-32) showed a noncancer hazard index of 1.5 for hypothetical future residential exposures to soil. This slightly exceeds the target index of 1.0, however residential development at this site is unlikely. Therefore, the risks due to residential exposures are likely overestimated. No unacceptable risks were calculated for occupational exposures; therefore, no unacceptable risks are expected for likely exposures at these sites.

Regional Groundwater Exposure Pathway

Risks associated with contaminants in groundwater were also assessed by comparing measured concentrations of contaminants in the groundwater and model-predicted future concentrations in groundwater to conservative risk-based concentrations. Risk assessment was performed in regional groundwater using both investigation results and modeling results and the exposure factors presented in EPA Region 3 RBCs. The EPA Region 3 RBCs are conservative criteria that consider ingestion of groundwater under a residential scenario. Following are the sites that were evaluated in the risk assessment process and presented no unacceptable risk.

- Fire Training Areas 6, 7B, and 7C (FT-06, FT-07B, FT-07C)
- Solid Waste Disposal Area (LF-23)
- Perimeter Road (OT-10)
- Wash Water Accumulation Basin (SS-28)
- DRMO Storage Area (SS-30)
- Former Underground Storage Tanks at POL Yard (ST-13)

- BX Service Station (ST-31)
- MX Service Station (ST-32)
- Fuel Hydrant No. 9 (ST-34)
- Entomology Shop Yard (SD-12)
- MWR Auto Hobby Shop/Munitions Trailer Maintenance Shop (SD-24)
- Flight Line Storm Drain (SD-25)
- Vehicle Wash Rack (SD-27)
- Drum Accumulation Pad (SS-29)
- Munitions Disposal Area (OT-16)
- Lagoon Landfill (LF-01)

Perched Groundwater - ST-11

One site, Flight Line Fuel Spill Site ST-11, showed a risk to hypothetical future residents if the perched water zone was ever utilized for a potable water source. The excess cancer risk calculated for this scenario is one in 100. However, modeling does not indicate a risk to regional groundwater which is used as drinking water because the levels of contaminants in perched groundwater would not contribute contaminants at levels exceeding MCLs.

Lagoon Landfill LF-01

The Lagoon Landfill (LF-01) showed cancer risks of 2×10^{-4}, for hypothetical future residential exposures to sediments in the sewage lagoon (if it were drained and used for residential purposes in the future). However residential development at this site is unlikely. Therefore, the risks due to residential exposures are likely overestimated. No unacceptable risks were calculated for occupational exposures; therefore, no unacceptable risks are expected for likely exposures at these sites.

The risk assessment conducted as part of the Remedial Investigations for OU1, OU3, and OU6 (risk assessment was not conducted at OU5 because all contaminated material was removed) concluded that contaminants are not present in environmental media (soil, surface water, air, or groundwater) at MHAFB at current points of exposure at concentrations that could pose a significant human health risk or environmental risk under present future site use. In addition, evaluation of the groundwater pathway concluded that contaminants will not be transported to regional groundwater in the future at concentrations that could pose a significant health risk.

B. ENVIRONMENTAL RISKS

The Basewide Ecological Risk Assessment (ERA) was done to assess the actual or potential adverse impacts on plant and animal species from chemicals released to the environment at the sites investigated through the CERCLA process. As part of the Basewide ERA, ecological receptors were identified on a Basewide basis. The presence or absence of transport mechanisms for contaminants from individual sites to ecological receptors was determined. The presence of critical habitat, federal- or state-protected species, or other species of special concern was assessed (no critical habitat was identified), and the potential for adverse ecological impacts to any of these species by contaminants at the sites was estimated. Sources of contaminants and combinations of sources of contaminants with the greatest relative potential for adverse ecological impacts were identified. Ecological receptors at the greatest potential risk due to exposure to multiple sources were evaluated.

Potential toxic effects on individuals of key species were considered as the first step in estimating potential population effects. Potential effects on the population considered the abundance or rarity and sensitivity of the key receptors and the potential for alternate habitat for the species. The loss of one individual of a rare threatened and endangered species could be significant. However, none of the key receptor species at the Base are rare in a regional context. Similarly, the habitat suitable for wildlife at the Base is not unique or rare in a regional context, although the aquatic and wetland habitats present at the Wastewater Lagoons and Flight Line Storm Drain are uncommon in the region. For that reason, most of the key receptors (individuals) inhabiting or frequenting the Base will also be found in similar areas beyond the Base boundaries, reducing the potential for impacts at the population level.

No populations of any identified plant or animal species are at risk, although sensitive individual plants could be at risk at one site (SD-25, Flight Line Storm Drain, OU6), and individual animals could be at risk at one site (LF-01, Wastewater Lagoons, OU2). In addition, a few chemicals slightly exceeded the conservative chemical benchmarks at several of the sites. However, as discussed in the MHAFB OU3 Ecological Risk Assessment, because of the very conservative nature of the chemical benchmarks and because of other very conservative assumptions used in the ecological risk assessment, no measurable adverse ecological effects are expected to animal or plant populations.

C. SUMMARY OF SITE RISK CONCLUSION

In conclusion, based on the results from the field investigation and the risk assessment, remedial action is not necessary for the protection of human health and the environment for the soil or the regional groundwater at all the sites except for the perched water at the Flight Line Fuel Spill site (ST-11).

D. REMEDIAL GOALS FOR SITE ST-11

The No Remedial Action alternative is proposed for both the soil and the regional groundwater at all the sites except for the Flight Line Fuel Spill Site, ST-11.

Remedial action was deemed necessary for Site ST-11 to prevent human and environmental exposure to the contaminated perched water, and to address the uncertainties with the future land use. The Remedial Action Objectives (RAOs) for Site ST-11 are:

- The protection of human health by preventing human exposure to the perched water

- The protection of the environment by preventing an inadvertent release through either accidental penetration of the contaminated zone or extraction and release of contaminated groundwater to the environment

VII. DESCRIPTION OF ALTERNATIVES

The alternatives analyzed for the Flight Line Fuel Spill Site (ST-11) are presented below. The alternatives are listed in the order they are presented in the Remedial Investigation/Feasibility Study report.

Alternative 1: No Remedial Action (included as a baseline for comparison)

The No Remedial Action alternative would require nothing be done to the site now and is considered as a baseline for comparison in accordance with the National Contingency Plan. With this alternative, contamination will be left in place, and a 5-year review of the site would be necessary.

Alternative 2: Limited Action

The components of this alternative are:

- Access control - Currently, the USAF closely restricts access owing to the fact that most of the area is in a restricted area of MHAFB (guards monitor the area 24 hours a day).

- Notice of Restriction, which will identify the perched zone and prohibit drilling of the perched zone or use of the perched water as drinking water on the MHAFB Comprehensive Plan. The Plan will be registered on land plat maps held by MHAFB. The land is held by lease by the Air Force and can not go back to the land holder (Bureau of Land Management) until contamination is below MCLs.

- Leak detection program, which will ensure early detection of any future petroleum leaks at the site. The program includes petroleum inventory and annual flight line leak detection programs.

- Sampling of the perched groundwater prior to removal of the land use restriction to ensure that perched water meets the standards of the Safe Drinking Water Act.

- Monitoring of the perched groundwater quality in accordance with the approved groundwater monitoring plan.

With this alternative, contamination will be left in place, and a 5-year review of the site would be necessary.

Alternative 3: Remedial Action by Pump and Treat (would entail installation of a pump-and-treat system to remove contaminated perched water and treat it to remove contaminants).

The Pump and Treat alternative would actively extract contaminated groundwater using a series of closely spaced extraction wells. Water delivered from the extraction system would be passed through an air stripper for volatile organic compound removal with a catalytic ozonator added to treat the volatile air emissions from the air stripping process.

Evaluation of Alternatives

The NCP (at 40 CFR 300.430[e][9][iii]) lists nine criteria to be considered in the evaluation and comparison of remedial action alternatives. The first two criteria are considered "threshold" criteria. If an alternative does not meet these threshold criteria, it cannot be selected. The USAF, USEPA, and IDHW used these criteria as a basis for the evaluation of the alternatives. Based on the evaluation, the preferred remedial alternative for the perched water at Site ST-11 is the Limited Action alternative. A discussion of the criteria follows:

Criterion 1 - Overall Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Limited Action and Pump and Treat are considered protective of human health and the environment. The No Remedial Action alternative is only considered protective if the current land use does not change and the perched water is not used for drinking water. The Pump and Treat alternative is considered most protective because contaminants would be permanently removed from the perched groundwater to levels that pose no health risk.

The Limited Action alternative is also considered protective because currently there are no users of the perched groundwater, and the filing of a Notice of Restriction at the site will prevent any future human and environmental exposure to the contaminated perched water. Furthermore, the Limited Action alternative will require an evaluation of the perched zone to ensure that the perched water meets applicable drinking water standards before it can be used as a drinking water source. This would be done by installing a monitoring well and collecting perched water sample(s) to be analyzed for fuel-related contamination.

Criterion 2 - Compliance with Federal and State Environmental Standards

This criterion addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental regulations. ARARs considered here include provisions of the Federal Safe Drinking Water Act enacted as Public Law

93-523, December 16, 1974, and the Idaho Administrative Procedure Act (IDAPA), Section 16, Title 02, Water Quality Standards and Wastewater Treatment Requirements, July 1993.

The No Remedial Action alternative would not meet this criterion because inadvertent exposure to hazardous levels of contaminants could occur if the perched water were considered as a drinking water source. The Limited Action and Pump and Treat alternatives are considered to be compliant with the pertinent environmental regulations. The Limited Action, although without active treatment will meet the ARARs within a reasonable time frame. The Limited Action alternative meets this criterion because it considers the perched groundwater as a water of the State of Idaho and, as such, addresses the State's concerns should this water ever be used for domestic supply. Furthermore, the Limited Action alternative will also ensure that ARARs are met prior to the removal of the Notice of Restriction. The Pump and Treat alternative would meet the criterion more quickly and effectively because contaminant concentrations in the perched water would be quickly and permanently reduced to acceptable levels.

Criterion 3 - Long-Term Effectiveness and Permanence

This criterion addresses the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time.

The No Remedial Action alternative does not meet this criterion because no action would be taken, contaminants would be left in place, and inadvertent exposure to these contaminants could occur. Since the source for the release in the pipeline has been addressed and a leak detection program is performed annually along the pipeline, both the Limited Action and the Pump and Treat alternatives meet this criterion. The Limited Action alternative would prevent inadvertent human and environmental exposures to the perched water. However, the Pump and Treat alternative would meet this criterion sooner and more effectively because it would actively reduce the concentration of contaminants to below federally regulated Maximum Contaminant Levels (MCLs).

Criterion 4 - Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the degree to which a remedy reduces toxicity, mobility, and volume of the hazardous substances or impacted media.

The No Remedial Action and Limited Action alternatives do not actively reduce the level of contaminants through treatment at Site ST-11. However, no reductions are needed immediately because site access and use are restricted.

Mobility is not reduced for the No Remedial Action alternative because inadvertent release of the contaminants could occur if the land use changes. The Notice of Restriction filed for the Limited Action alternative will prevent inadvertent release of Site ST-11 contaminants by specifically preventing any subsurface intrusion (i.e., drilling) through the confining layer under the perched water. The Pump and Treat alternative is the only alternative that would meet this criterion by permanently reducing the toxicity, mobility, and volume of hazardous constituents in the perched system by treatment.

Criterion 5 - Short-Term Effectiveness

This criterion addresses the period of time needed to achieve protection of human health and the environment, and any adverse impacts that may be posed during the construction and implementation period.

Since ST-11 is in a restricted area of MHAFB, and no receptor is associated with the current industrial land use, all three alternatives would be effective for short term. The No Remedial Action and Limited Action alternatives do not currently require any implementation, while the Pump and Treat alternative would require one year to implement. Standard protective construction procedures would be followed during the implementation of the Pump and Treat alternative.

Criterion 6 - Implementability

This criterion addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the alternative.

The Limited Action and No Remedial Action alternatives are easily implementable. Virtually no effort would be required to carry out the No Remedial Action alternative. Minimal effort would be expended to file a Notice of Restriction for land use under the Limited Action alternative, and site access restrictions due to MHAFB security are already in place. Also, should land use change in the future to residential, installation of a monitoring well and collection of a water

sample for water quality analysis would require little effort. The Pump and Treat alternative could be implemented with much more difficulty because of the use of the site as an active aircraft parking apron and taxiway.

Criterion 7 - Costs

This criterion addresses the estimated capital (direct and indirect) and operation and maintenance costs associated with the alternative. In comparison to the other alternative, these costs are summarized in Table 41a.

No cost is required to implement the No Remedial Action alternative at this site. The cost for the Limited Action alternative is relatively small as it requires the proper public notification in certain offices at MHAFB, the installation of a monitoring well, and the collection of perched water samples to demonstrate the effectiveness of natural attenuation of fuel-related contaminants. The cost to administer the Notice of Restriction, including changes to appropriate documents (Base Comprehensive Plan), is estimated at $5,050. The estimated cost to install a perched zone well is $14,000, and the estimated cost to abandon the well (assuming a present cost of $1,500, an inflation rate of 5 percent per year, and a monitoring period of five years) is $1,823. The estimated total capital costs are $20,873. Assuming that perched zone monitoring will occur once per year for a period of five years, and assuming a present cost of $2,175 for sampling and reporting (again with 5 percent inflation) total operations and maintenance is estimated at $12,018. The total cost for this alternative is estimated to be $32,891. The actual cost will depend on the frequency and duration of sampling. These will be described in a Groundwater Sampling Plan. Table 41b shows the detailed cost estimates for Limited Action at ST-11 in addition to the alternative cost analysis.

The capital costs to implement the Pump and Treat alternative are relatively high. The cost for system installation would be about $1,355,789. The present-worth operation and maintenance costs associated with the system for a 1-year life is $48,981, and the total present worth cost using a 5 percent rate over 1 year is $1,404,770.

TABLE 41a

ALTERNATIVE COST ANALYSIS FOR SITE ST-11

	Alternative I No Action	Alternative II Limited Action	Alternative III Pump & Treatment
Capital Costs	$0	$20,873	$1,355,789
Operation and Maintenance	$0	$12,018	$48,981
Present Worth	$0	$32,891	$1,404,770

TABLE 41b

DETAILED COST ANALYSIS FOR LIMITED ACTION AT SITE ST-11

		Year 1	Year 2	Year 3	Year 4	Year 5	Total
Costs							
	Notice	$5,050					
	Well Installation	$14,000					
	Well Abandonment[1]					$1,823	
	Analytical	$275	$289	$303	$318	$334	
	Field Labor[2]	$800	$840	$882	$926	$972	
	Materials	$100	$105	$110	$116	$122	
	Report[3]	$1,000	$1,050	$1,103	$1,158	$1,216	
	Total[4]	$21,225	$2,284	$2,398	$2,518	$4,467	$32,891

(1) Well abandonment was estimated based on a present cost of $1,500 and 5 percent per year inflation.
(2) Field labor costs were estimated by assuming 10 hours labor per event for each of 2 individuals at $40 per hour per individual.
(3) Reporting costs were estimated at 10 hours of labor for 1 individual at $50 per hour plus $500 per event for word processing, duplicating, clerical, and materials.
(4) An inflation rate of 5 percent per year was assumed.

Criterion 8 - State Acceptance

The State of Idaho concurs with the selected remedy.

Criterion 9 - Community Acceptance

This criterion addresses whether community concerns are addressed by the preferred remedy and whether the community has a preference for a remedy.

The community has been made aware of the Proposed Plan through public meetings and an open public comment period. This is described in Section III of the ROD. One individual from the public attended the public meeting. No oral or written comments regarding the Proposed Plan were received.

VIII. THE SELECTED REMEDY

USAF, EPA, and IDHW have determined that no remedial action is necessary under CERCLA at 32 of the 33 sites investigated. The selected remedy at ST-11 meets the Remedial Action Objectives, and will ensure protection of human health and the environment.

The selected remedy for Site ST-11 is the Limited Action alternative. This alternative prevents inadvertent human and environmental exposures to the contaminated perched water and meets all applicable, relevant, and appropriate requirements (ARARs) within a reasonable time frame. This alternative is more cost effective than the Pump and Treat alternative. Furthermore, it is also more implementable.

The Limited Action consisting of the following components:

- Notice of Restriction, which will identify the perched zone and prohibit drilling of the perched zone or use of the perched water as drinking water on the MHAFB Comprehensive Plan. The Plan will be registered on land plat maps held by MHAFB. The land is held by lease by the Air Force and can not go back to the land holder (Bureau of Land Management) until contamination is below MCLs.

- Leak detection program, which will ensure early detection of any future petroleum leaks at the site. The program includes petroleum inventory and annual flight line leak detection programs.

- Sampling of the perched groundwater prior to removal of the land use restriction to ensure that perched water meets the standards of the Safe Drinking Water Act.

- Monitoring of the perched groundwater quality in accordance with the approved groundwater monitoring plan.

This action is necessary because of the risk identified from the contaminated perched water if the perched water zone were considered as a source of drinking water. This action will meet the remedial action objectives within the reasonable time frame for this site by ensuring:

- The protection of human health by preventing human exposure to the perched water

- The protection of the environment by preventing an inadvertent release through either accidental penetration of the contaminated zone or extraction and release of contaminated perched groundwater to the environment

Because contaminants will be left in place, this alternative would include the statutory 5-year review requirements to ensure that the selected remedy is still protective of human health and the environment.

The no action for 32 of the 33 sites addressed in this ROD includes long-term monitoring of the regional Snake River Plains aquifer at MHAFB. The purpose of the long-term monitoring of the regional groundwater is to address uncertainties associated with the fate and transport modeling. The planned monitoring will be done at least annually for a minimum of five years collecting samples at specific wells for laboratory analysis of selected VOCs and selected metals in accordance with the monitoring plan. Based on the assumption that eight wells will be sampled annually for five years, the present worth estimated cost of this annual sampling for five years considering a 5% interest rate is $47,520. This costs includes laboratory analysis, sample collection, data validation, and a summary report. Table 42 shows the costs estimated for no-

TABLE 42

COST ANALYSIS FOR REGIONAL GROUNDWATER MONITORING

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Costs						
Analytical[1]	$4,000	$4,200	$4,410	$4,631	$4,862	
Field Labor[2]	$1,600	$1,680	$1,764	$1,852	$1,945	
Materials[3]	$500	$525	$551	$579	$608	
Report[4]	$2,500	$2,625	$2,756	$2,894	$3,039	
Total[5]	$8,600	$9,030	$9,482	$9,956	$10,453	$47,520

(1) Analytical costs assume 8 wells sampled annually at a cost of $500 per well.
(2) Field labor costs assume a total of 20 hours labor per event for each of 2 individuals at $40 per hour per individual.
(3) Expendable equipment was estimated at $500 per event.
(4) Reporting costs were estimated at 40 hours of labor for one individual at $50 per hour plus $500 per event for word processing, duplicating, clerical, and materials.
(5) An annual inflation rate of 5 percent per year was assumed.

action monitoring of regional groundwater assuming that each of 8 existing wells will be sampled annually for a period of 5 years.

Results of the monitoring will be used to evaluate analyte-specific trends to determine whether further monitoring or other action is necessary to ensure protection of human health and the environment.

IX. STATUTORY DETERMINATION

Based on the results of the Baseline Risk Assessment and other information available in the administrative record, no action is necessary for soil or groundwater to ensure protection of human health and the environment.

The selected remedy at ST-11 is protective of human health and the environment, and will comply with federal and state requirements that are applicable or relevant and appropriate within a reasonable time frame. ARARs considered here include provisions of the Federal Safe Drinking Water Act enacted as Public Law 93-523, December 16, 1974, and the Idaho Administrative Procedure Act (IDAPA), Section 16, Title 02, Water Quality Standards and Wastewater Treatment Requirements, July 1993. It is also cost effective. The remedy at Site ST-11 does not satisfy the statutory preference for treatment as a principal element of the remedy. However, the restriction placed at the site prevents exposure to humans and protects the environment by preventing an inadvertent release or excursion of the contaminated groundwater and requires that MCLs be met prior to lifting this restriction. Sampling will be conducted to ensure that the perched groundwater meets drinking water quality prior to removal of the land restriction.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

X. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes have been made to the Remedial Investigation Report or to the selected remedy as proposed in the proposed plan that was released for public comment on June 19th, 1995. Perched groundwater at ST-11 will be monitored in accordance with the groundwater

monitoring plan. Costs associated with perched groundwater monitoring were not estimated in the Proposed Plan. For this reason, the estimated costs for Limited Action at ST-11 is $27,841 greater than the $5,050 that was estimated for the Notice of Restriction described in the Proposed Plan.

APPENDIX A
TABLES 1-31, 38 & 39

TABLE 1

SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER SAMPLES AT THE NORTH CELL, WASTEWATER LAGOONS

Locator/Sample Round/Sample No.	NLC-001-001			NLC-001-002			NLC-001-003			NLC-002			NLC-003		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Semivolatile Organics (µg/L)															
Phenol	3	10	J	<	10	U	<	10	U						
Di-n-butylphthalate	1	10	J	1	10	J	<	10	U						
4-Methylphenol	6	10	J	<	10	U	<	10	U						
bis(2-Ethylhexyl)phthalate	1	10	J	<	10	U	<	10	U						
Water Quality (mg/L)															
Alkalinity, Total as CaCO3 at pH 4.5										195	5		198	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5										195	5		155	5	
Alkalinity, Carb. as CaCO3 at pH 8.3										<	5	U	43	5	
Chloride										24.8	3	J	66.4	3	
Fluoride										1.5	0.1	J	0.5	0.1	
Nitrate plus Nitrite as N										2	0.1		<	0.1	U
Orthophosphate as P										4.9	1		6.1	0.5	
Sulfate										21.7	5	J	117	5	
Total Dissolved Solids										691	10		562	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 2

SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER SAMPLES AT THE EAST CELL, WASTEWATER LAGOONS

Locator/Sample Round/Sample No.	ELC-001-004			ELC-002			ELC-003		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Semivolatile Organics (µg/L)									
1,2-Dichlorobenzene	1	10	J						
Naphthalene	11	10	J						
Water Quality (mg/L)									
Alkalinity, Total as CaCO3 at pH 4.5				199	5		204	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5				199	5		204	5	
Chloride				69.9	3	J	55	3	
Fluoride				0.24	0.1	J	0.48	0.1	
Orthophosphate as P				4.6	0.5		3.2	0.25	
Sulfate				117	5	J	96.3	5	
Total Dissolved Solids				628	10		486	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 3

SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER SAMPLES AT THE WEST CELL, WASTEWATER LAGOONS

Locator/Sample Round/Sample No.	WLC-001-006			WLC-002			WLC-003		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)									
Benzene	0.11	0.4	J						
Water Quality (mg/L)									
Alkalinity, Total as CaCO3 at pH 4.5				210	5		216	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5				210	5		216	5	
Chloride				89.7	3	J	66.7	3	
Fluoride				<	0.1	UJ	0.39	0.1	
Orthophosphate as P				2.2	0.5		2.6	0.25	
Sulfate				126	5	J	111	5	
Total Dissolved Solids				776	10		557	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 4

SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER SAMPLES AT THE SOUTH CELL, WASTEWATER LAGOONS

Locator/Sample Round/Sample No.	SLC-001-001			SLC-001-007			SLC-001-009			SLC-002			SLC-003		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Semivolatile Organics(µg/L)															
bis(2-Ethylhexyl)phthalate				57	9		<	9	U						
Water Quality (mg/L)															
Alkalinity, Total as CaCO3 at pH 4.5										180	5		244	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5										163	5		244	5	
Alkalinity, Carb. as CaCO3 at pH 8.3										17.3	5		<	5	U
Chloride										96.9	3	J	87.2	3	
Fluoride										<	0.1	UJ	0.18	0.1	
Nitrate plus Nitrite as N										<	0.1	U	0.14	0.1	
Orthophosphate as P										4.4	0.5		0.59	0.05	
Sulfate										120	5	J	140	5	
Total Dissolved Solids										673	10		653	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 4A

MAXIMUM SEDIMENT CONCENTRATIONS FOR LAGOON LANDFILL (LF-01) AND FLIGHTLINE STORM DRAIN (SD-25)

	LF-01	SD-25
Methylene Chloride	2 J	5 J
Acetone	170	71 J
Carbon Disulfide	7 J	
2-Butanone	32 J	33 J
Tetrachloroethene	1 J	2 J
Toluene	26 J	12 J
Ethylbenzene	2 J	400 J
Xylenes (total)	16 J	2,500
Total Petroleum Hydrocarbons	5,210	
1,2-Dichloroethene (total)		470 J
1,1,1-Trichloroethane		19 J
Chlorobenzene		890 J
Trichloroethene		3.6 J

J = Estimated value below sample reporting limit or estimated based on quality control criteria

U = Not detected

UJ = Estimated nondetect

Note: Total Petroleum Hydrocarbons refers to analyses by EPA Method 418.1 for Total Petroleum Hydrocarbons

TABLE 5

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-1

Locator/Sample Round	OU3-MW1-RGW-002			OU3-MW1-RGW-003			OU3-MW1-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Semivolatile Organics (µg/L)									
bis(2-Ethylhexyl) phthalate	<	10	U	<	10	U	3		J
Di-n-octylphthalate	<	10	U	<	10	U	3		J
Metals (µg/L)									
Aluminum	2090								
Arsenic	5								
Barium	152								
Calcium	140000								
Cobalt	6								
Iron	5080								
Lead	3.9		J						
Magnesium	45000								
Manganese	324								
Potassium	8340								
Sodium	91000								
Vanadium	18.2								
Water Quality (mg/L)									
Alkalinity, Total as CaCO3 at pH 4.5	411	5		330	5		365	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	411	5		330	5		365	5	
Chloride	80.3	3		79.6	3	J	79.4	3	
Fluoride	0.17	0.1		<	0.1	UJ	0.24	0.1	
Nitrate plus Nitrite as N	7.3	0.5		7.5	0.5		8	0.5	
Orthophosphate as P	<	0.05	U	0.055	0.1		0.072	0.05	
Sulfate	78.4	5		77.7	5	J	75.7	5	
Total Dissolved Solids	698	10		702	10		664	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 6

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-2

Locator/Sample Round	LF02-MW02-RGW-001			OU3-MW2-RGW-002			MW2-RGW-003			OU3-MW2-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)												
Aluminum	3820			5700			623		J	3040		U
Arsenic	1.1			<	1	U	<	1	U	<	1	U
Barium	28.5			28.9			<	15.8	U	<	21.1	U
Calcium	20300			21000			16200			16500		J
Chromium	10.5			22.3		U	<	8	U	10.9		
Copper	7.8		J	<	12.5	U	<	4.8	U	<	5	U
Iron	5630			6580			4820		J	4220		UJ
Lead	1.8		J	7.6		U	3.9		U	5.3		UJ
Magnesium	7070			7460			6960		J	6380		
Manganese	144			142			123			94.6		U
Nickel	11.3			<	15.3	U	<	8	U	<	13.3	U
Potassium	3450			3550			2840			<	2820	U
Sodium	12400			12700			10100			10800		
Vanadium	19.3			21.1			18.2			<	19.7	U
Zinc	19.6			25.3		U	<	16.4	U	<	17.8	U
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	66			63.2	5							
Alkalinity, Bicarb. as CaCO3 at pH 4.	66			63.2	5							
Chloride	3.9			4	3							
Fluoride	0.14			0.13	0.1							
Nitrate plus Nitrite as N	1.2			0.86	0.1							
Orthophosphate as P	0.14		J	<	0.05	U						
Sulfate	8.5			9	5							
Total Dissolved Solids	125			130	10							

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 7

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-3

Locator/Sample Round	LF02-MW03-RGW-001			OU3-MW3-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)						
Aluminum	48.6			<	68.8	U
Barium	6.1			8.1		
Calcium	14600			14500		
Iron	274			974		
Magnesium	4810			4800		
Manganese	11.6			<	17.8	U
Potassium	3390			3130		
Sodium	11400			10900		
Vanadium	14.2			12.5		
Zinc	<	7.2	U	8.1		
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	64.5			63.2	5	
Alkalinity, Bicarb. as CaCO3 at pH 4	64.5			63.2	5	
Chloride	3.2			3.5	3	
Fluoride	0.15			0.14	0.1	
Nitrate plus Nitrite as N	1.1			0.85	0.1	
Orthophosphate as P	<	0.05	UJ			
Sulfate	7			7.9	5	
Total Dissolved Solids	119			122	10	
Total Petroleum Hydrocarbons (mg/L)						
TPH	29.6		J	<	1	U

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 8

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-4

Locator/Sample Round	LF02-MW04-RGW-001			OU3-MW4-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)						
Aluminum	76.9			102		
Barium	7.4			8.2		
Calcium	13200			13100		
Iron	350			<	210	U
Lead	3.8		J	<	1	U
Magnesium	4290			4240		
Manganese	15.9			<	10.3	U
Potassium	3270			3290		
Sodium	13000			12400		
Vanadium	17.8			15.4		
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	61.1			57.6	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	61.1			57.6	5	
Chloride	3.5			3.3	3	
Fluoride	0.18			0.15	0.1	
Nitrate plus Nitrite as N	1			0.89	0.1	
Orthophosphate as P	0.068		J			
Sulfate	7.9			7.9	5	
Total Dissolved Solids	113			125	10	
Total Petroleum Hydrocarbons (mg/L)						
TPH	10.1		J	<	1	U

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 9

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES FOR MW-5

Locator/Sample Round	LF02-MW05-RGW-001			OU3-MW5-RGW-002			OU3-MW5-RGW-003			OU3-MW5-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Semivolatiles (µg/L)												
bis(2-Ethylhexyl)phthalate	120		J	<	10	U	<	10	U	<	11	U
Metals (µg/L)												
Aluminum	30			<	30	U	<	46	UJ	<	36	U
Barium	7			5.7			<	4.5	U	<	5.6	U
Calcium	13300			13100			12400			11700		J
Iron	110			470			341			193		U
Magnesium	4270			4400			4030		J	<	4040	U
Manganese	23.1			<	13.4	U	<	14.8	U	<	5.5	U
Potassium	3210			3370			2950			<	2640	U
Selenium	<	1	UJ	<	2	UJ	2.6		J	<	2	UJ
Sodium	11700			12000			9680			10100		
Vanadium	14.5			12.5			15.4			<	17.2	U
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	61			60.1	5							
Alkalinity, Bicarb. as CaCO3 at pH 4.5	61			60.1	5							
Chloride	3.6			3.5	3							
Fluoride	0.16			0.14	0.1							
Nitrate plus Nitrite as N	0.9			0.84	0.1							
Orthophosphate as P	0.22		J	0.16	0.05							
Sulfate	8.5			8.3	5							
Total Dissolved Solids	116			130	10							
Total Petroleum Hydrocarbons (mg/L)												
TPH	3.9		J	<	1	U						

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 10

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-6

Locator/Sample Round	LF01-MW06-RGW-001			OU3-MW6-RGW-002			OU3-MW6-RGW-003			OU3-MW6-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Resul	RL	Qual	Result	RL	Qual
Semivolatile Organics (µg/L)												
bis(2-Ethylhexyl) phthalate	<	10	UJ	4		J	<	10	UJ	<	10	U
Metals (µg/L)												
Barium	6.6			23								
Calcium	23400			6.5								
Iron	578			19200								
Magnesium	7720			<	344	U						
Manganese	13.9			<	11.5	U						
Potassium	4100			6450								
Sodium	15900			3750								
Vanadium	14.3			13900								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	64			63.5	5		59.1	5		64.1	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	64			63.5	5		59.1	5		64.1	5	
Chloride	11.1			8.1	3		7.1	3	J	7.8	3	
Fluoride	0.15			0.14	0.1		0.13	0.1	J	0.21	0.1	
Nitrate plus Nitrite as N	3.7			2.2	0.1		2.1	0.1		1.9	0.1	
Orthophsphate as P	0.064		J	<	0.05	U	<	0.05	U	<	0.05	U
Sulfate	28			19.1	5		18.5	5	J	17.6	5	
Total Dissolved Solids	173			169	10		154	10	J	152	10	
Total Petroleum Hydrocarbons (mg/L)												
TPH	20.8		J	<	1	U						

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 11

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-7

Locator/Sample Round	LF01-MW07-RGW-001			OU3-MW7-RGW-002			OU3-MW7-RGW-003			OU3-MW7-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Trichloroethene	0.2		J	<	0.38	U	0.22	0.38	J	<	0.35	U
Metals (µg/L)												
Arsenic	1.1			<	1	U						
Barium	24			28.8								
Calcium	55000			63000								
Iron	397			<	347	U						
Magnesium	20500			24100								
Manganese	12.3			<	19	U						
Potassium	6170			7080								
Sodium	33000			37800								
Vanadium	7.2			7.7								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	180			209	5		175	5		168	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.	180			209	5		175	5		168	5	
Chloride	36.8			46.3	3		54.4	3	J	32.5	3	
Fluoride	0.2			0.1	0.1				R	0.17	0.1	
Nitrate plus Nitrite as N	6.9			5.1	0.2		4.9	0.5		3.8	0.2	
Orthophosphate as P	0.12		J	<	0.05	U	<	0.05	U	<	0.05	U
Sulfate	35.8			31.8	5		53.4	5	J	27.9	5	
Total Dissolved Solids	340			402	10		380	10		320	10	
Total Petroleum Hydrocarbons (mg/L)												
TPH	13.6		J	<	1	U						

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 12

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-8

Locator/Sample Round	LF01-MW08-RGW-001			OU3-MW8-RGW-002			OU3-MW8-RGW-003			OU3-MW8-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Benzene	<	0.4	U	0.39	0.4	J	<	0.4	U	<	0.4	U
Trichloroethene	<	0.38	U	0.55	0.38		0.3	0.38	J	<	0.35	U
Metals (µg/L)												
Aluminum	<	28	U	1430								
Arsenic	1.4			1.5								
Barium	13.2			19.5								
Calcium	55500			56100								
Chromium	<	5	U	14.7								
Iron	502			2020								
Magnesium	15900			15800								
Manganese	25.6			60.7								
Potassium	6230			6020								
Sodium	36300			33000								
Vanadium	6.8			7.7								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	170			155	5		106	5		189	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	170			155	5		106	5		189	5	
Chloride	37.6			39.3	3		22.7	3	J	42.7	3	
Fluoride	0.23			0.18	0.1		0.12	0.1	J	0.21	0.1	
Nitrate plus Nitrite as N	4.7			4.1	0.2		3.6	0.2		3.7	0.2	
Sulfate	35.4			43.2	5		31.6	5	J	35.6	5	
Total Dissolved Solids	333			365	10		268	10	J	368	10	
Total Petroleum Hydrocarbons (mg/L)												
TPH	24.7		J	<	1	U						

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.

RL = Reporting Limit

Qual = Qualifier

J = Estimated value.

R = Rejected value.

U = Nondetected value.

TABLE 13

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-9

Locator/Sample Round	LF01-MW09-RGW-001			OU3-MW9-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Trichloroethene	1.3			1.2	0.38	
Metals (µg/L)						
Barium	31.8			28		
Calcium	8200			70600		
Magnesium	24900			21800		
Potassium	7606			6520		
Sodium	27400			24700		
Vanadium	9.9			11.1		
Zinc	454			237		
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	98.4			91.8	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	98.4			91.8	5	
Chloride	60			53.6	3	
Fluoride	<	0.1	U	0.1	0.1	
Nitrate plus Nitrite as N	14.4			9.5	0.5	
Orthophosphate as P	0.4		J	<	0.05	U
Sulfate	143			113	5	
Total Dissolved Solids	474			455	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.

RL = Reporting Limit

Qual = Qualifier

J = Estimated value.

R = Rejected value.

U = Nondetected value.

TABLE 14

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-11

Locator/Sample Round	08-MW11-RGW-001			OU3-MW11-RGW-002			OU3-MW11-RGW-003			OU3-MW11-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Trichloroethene	1.3			1.6	0.38		1.5	0.38		2.7	0.4	
Metals (µg/L)												
Aluminum	97.6			323								
Barium	<	40.2	U	36.2								
Calcium	98600			86800								
Iron	140			<	447	U						
Lead	2.2		J	<	2	U						
Magnesium	29400			26700								
Manganese	16.2			<	6.9	U						
Potassium	7650			7160								
Selenium	1.5		J	<	2	UJ						
Sodium	29200			26500								
Vanadium	9.2			9.6								
Zinc	572			429								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	91.4			93.2	5		86.7	5				
Alkalinity, Bicarb. as CaCO3 at pH 4.5	91.4			93.2	5		86.7	5				
Chloride	75.3			66	3		64.4	3	J			
Nitrate plus Nitrite as N	15.6			11.7	0.5		11.1	0.5				
Orthophosphate as P	0.5		J	<	0.05	U	<	0.05	U			
Sulfate	180			146	5		144	5	J			
Total Dissolved Solids	553			561	10		542	10				

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.

RL = Reporting Limit

Qual = Qualifier

J = Estimated value.

R = Rejected value.

U = Nondetected value.

TABLE 15

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT PERCHED WELLS AT MW-12

LOCATOR	LF01-MW12-PGW-001			LF01-MW12-PGW-001-conf.		
	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)						
Aluminum	112000		J	3940		J
Barium	893		J	126		
Beryllium	5.6		J	<	1	U
Calcium	152000			81000		J
Chromium	147		J	39.2		J
Cobalt	57.6		J	4.5		J
Copper	118		J	10		J
Iron	132000		J	4800		J
Lead	50.6		J	1.8		J
Magnesium	79700		J	32000		J
Manganese	2490		J	113		J
Nickel	142		J	24.9		J
Potassium	23800		J	6550		J
Sodium	74600			67700		
Vanadium	156		J	12.2		J
Zinc	382		J	68.5		J
TPH (mg/L)						
Total Petroleum Hydrocarbons	<	1	UJ	<	1	UJ
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	360			355		
Alkalinity, Bicarb. as CaCO3 at pH 4.5	360			355		
Chloride	69.6			68.6		
Fluoride	0.31			0.26		
Nitrate plus Nitrite as N	9.1			11.2		
Orthophosphate as P	0.68		J	0.062		J
Sulfate	72.1			73.6		
Total Dissolved Solids	800			692		

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.

RL = Reporting Limit

Qual = Qualifier

J = Estimated value.

R = Rejected value.

U = Nondetected value.

TABLE 16

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT PERCHED WELLS AT MW-15

Locator/Sample Round	LF01-MW15-PGW-001			LF01-MW15-PGW-001-conf.		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Trichloroethene	<	0.38	U	0.3		J
Semivolatile Organics (µg/L)						
bis(2-ethylhexyl)phthalate	<	10	U	1		J
Pesticides/PCB's (µg/L)						
Heptachlor epoxide	<	0.048	U	0.045		J
Metals (µg/L)						
Aluminum	78100		J	5700		J
Barium	684		J	96.6		
Beryllium	5.5		J	<	1	U
Calcium	164000			96600		J
Chromium	330		J	58.9		J
Cobalt	39.3		J	5.5		J
Copper	86.4		J	14.8		J
Iron	105000		J	7810		J
Lead	49.3		J	2.3		J
Magnesium	60200		J	35100		J
Manganese	1740		J	145		J
Nickel	187		J	36.5		J
Potassium	14500		J	3930		J
Sodium	35600			32100		
Vanadium	111		J	13.5		J
Zinc	296		J	76.8		J
TPH (mg/L)						
Total Petroleum Hydrocarbons	<	1	UJ	8.4		J
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	265			258		
Alkalinity, Bicarb. as CaCO3 at pH 4.5	265			258		
Chloride	77.3			75.3		

TABLE 16

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT PERCHED WELLS AT MW-15

Locator/Sample Round	LF01-MW15-PGW-001			LF01-MW15-PGW-001-conf.		
	Result	RL	Qual	Result	RL	Qual
Water Quality (mg/L), cont.						
Fluoride	0.48			0.23		
Nitrate plus Nitrite as N	30			24.9		
Orthophosphate as P	0.1		J	0.27		J
Sulfate	67.8			66		
Total Dissolved Solids	672			614		

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 17

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-16

Locator/Sample Round	OU3-MW16-RGW-001			OU3-MW16-RGW-002			OU3-MW16-RGW-003			OU3-MW16-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Methylene Chloride	<	10	U	<	10	U	<	10	U	2		J
Metals (µg/L)												
Arsenic	2.5			2.4			1.8					
Barium	6.9			9.4			<	5.8	U			
Calcium	10600			12200			11300					
Iron	119			546			894		J			
Magnesium	2960			3070			2910		J			
Manganese	<	4	U	9.1			<	12.9	U			
Potassium	3950			3220			3210					
Selenium				<	20	UJ	3.4		J			
Sodium	12900			10300			10700					
Vanadium	19.1			17.3			17					
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	56.2	5		63.1	5		57.2	5		62.4	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	56.2	5		46.7	5		57.2	5		55.5	5	
Alkalinity, Carb. as CaCO3 at pH 8.3	<	5		16.4	5		<	5	U	6.9	5	
Chloride	3.9	3		<	3							
Fluoride	0.27	0.1		0.19	0.1		0.18	0.1	J	0.26	0.1	
Nitrate plus Nitrite as N	0.42	0.1		0.4	0.1		0.38	0.1		0.38	0.1	
Sulfate	5.5	5		5.4	5		5.7	5	J	5.4	5	
Total Dissolved Solids	114	10		119	10		122	10	J	107	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 18

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-17

Locator/Sample Round	OU3-MW17-RGW-001			OU3-MW17-RGW-002			OU3-MW17-RGW-0003			OU3-MW17-RGW-0004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)												
Barium	30.8			28.6								
Calcium	56300			56000								
Chromium	<	9	U	7.4								
Iron	1040			1740								
Magnesium	17300			17300								
Nickel	5.5			16.3								
Potassium	5480			6100								
Sodium	22900			22000								
Vanadium	7.2			6.7								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	113	5		113	5							
Alkalinity, Bicarb. as CaCO3 at pH 4.5	113	5		113	5							
Chloride	38.1	3		35.6	3							
Fluoride	0.15	0.1		0.1	0.1							
Nitrate plus Nitrite as N	6.9	0.5		5.9	0.5							
Orthophosphate as P	0.064	0.05		0.088	0.05							
Sulfate	64.2	5		60.2	5							
Total Dissolved Solids	333	10		336	10							

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 19

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT MW-18

Locator/Sample Round	OU3-MW18-RGW-001			OU3-MW18-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)						
Barium	33.5			29		
Calcium	50900			49800		
Iron	1840			1510		
Magnesium	15700			15300		
Manganese	21.9			27.4		
Potassium	6590			7120		
Sodium	24200			22000		
Vanadium	6.8			5.8		
Zinc	9.4			<	9.8	U
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	56	5		58.8	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	56	5		58.8	5	
Chloride	46.9	3		43.5	3	
Fluoride	0.21	0.1		0.13	0.1	
Nitrate plus Nitrite as N	8.5	0.5		7.6	0.5	
Orthophosphate as P	<	0.05		0.072	0.05	
Sulfate	84.9	5		77.1	5	
Total Dissolved Solids	382	10		331	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 20

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-1

Locator/Sample Round	BPW1-RGW-001			OU3-BPW1-RGW-003			OU3-BPW1-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)									
Trichloroethene	1.8			1.9			1.9	0.35	
Bromoform	2		J	<	10	U	<	10	U
Semivolatile Organics (µg/L)									
bis(2-Ethylhexyl)phthalate	<	10	U	2		J	<	10	U
Metals (µg/L)									
Arsenic	1.3								
Barium	2.8								
Calcium	292		J						
Manganese	8.4								
Water Quality (mg/L)									
Alkalinity, Total as CaCO3 at pH 4.5	107								
Alkalinity, Bicarb as CaCO3 at pH 4.5	107								
Chloride	38.4								
Fluoride	0.28								
Nitrate plus Nitrite as N	17								
Sulfate	78.1								
Total Dissolved Solids	393								

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 21

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-2

Locator/Sample Round	BPW2-RGW-001			OU3-BPW2-RGW-002			OU3-BPW2-RGW-003			OU3-BPW2-RGW-00		
	Result	RL	ual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Benzene	1.4			<	0.4	U	<	0.4	U	<	0.4	U
Trichloroethene	1.3			<	0.38	U	<	0.35	U	2.5	0.35	
Semivolatile Organics (µg/L)												
4-Nitrophenol	<	24	U	1		J	<	25	U	<	25	U
bis(2-ethylhexyl)phthalate	3		J									
Metals (µg/L)												
Barium	8.8			9.9								
Calcium	16500		J	16600								
Magnesium	3710		J	<	3800	U						
Potassium	4350		J	3620								
Sodium	14200		J	12500								
Vanadium	15.4			15.4								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	64.8			63.5	5							
Alkalinity, Bicarb. as CaCO3 at pH 4.5	64.8			63.5	5							
Chloride	4.9			4.7	3							
Fluoride	0.14			0.15	0.1							
Nitrate plus Nitrite as N	1.5			1.5	0.1							
Orthophosphate as P	0.36		J	<	0.05	U						
Sulfate	11.4			11.5	5							
Total Dissolved Solids	130			138	10							

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 22

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-4

Locator/Sample Round	BPW4-RGW-001			OU3-BPW4-RGW-002			OU3-BPW4-RGW-003			OU3-BPW4-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Acetone	<	10	U									
Bromoform	3		J									
Trichloroethene	1			1	0.38	J	1	0.35		1.1	0.35	
Metals (µg/L)												
Barium	11.6			13.2								
Calcium	32700		J	38100								
Magnesium	10200		J	12200								
Potassium	4470			4430								
Sodium	15300			16000								
Vanadium	136			13.5								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	87.8			88.6	5							
Alkalinity, Bicarb. as CaCO3 at pH 4.5	87.8			88.6	5							
Chloride	13.6			19	3							
Fluoride	0.14			0.1	0.1							
Nitrate plus Nitrite as N	6.6			6.4	0.5							
Orthophosphate as P	0.062		J	<	0.05	U						
Sulfate	27.8			36.5	5							
Total Dissolved Solids	225			248	10							

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 23

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-5

Locator/Sample Round	BPW5-RGW-001			OU3-BPW5-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Metals (µg/L)						
Barium	31.5			34.1		
Calcium	79400		J	80700		
Copper	53		J	<	7.7	U
Iron	<	17	U	831		
Lead	3.1		J	3.3		J
Magnesium	24400		J	24500		
Manganese	<	8	U	16.6		
Potassium	8440			7120		
Sodium	32900			28300		
Vanadium	10.3			8.6		
Zinc	131			176		
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	87.5			81	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	87.5			81	5	
Chloride	63.8			63.3	3	
Fluoride	0.14			<	0.1	U
Nitrate plus Nitrite as N	12.3			11	0.5	
Orthophosphate as P	0.11		J	<	0.05	U
Sulfate	154			153	5	
Total Dissolved Solids	490			545	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 24

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-6

Locator/Sample Round	BPW6-RGW-001			OU3-BPW6-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Semivolatile Organics (µg/L)						
bis(2-Ethylhexyl) phthalate	<	10	U	1		J
Metals (µg/L)						
Arsenic	3.8			2.5		
Barium	12.7			30.4		
Calcium	22000			53900		
Magnesium	5460			13700		
Potassium	4750		J	6780		
Sodium	11900		J	18500		
Vanadium	21.3			18.3		
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	58.6			57.2	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	58.6			57.2	5	
Chloride	8.4			31.8	3	
Fluoride	0.19			0.16	0.1	
Nitrate plus Nitrite as N	1.2			3.6	0.2	
Sulfate	29			111	5	
Total Dissolved Solids	185			354	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 25

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-7

Locator/Sample Round	BPW7-RGW-001			OU3-BPW7-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Methylene Chloride	<	10	U	1		J
Metals (µg/L)						
Barium	<	57.3	U	42		
Cadmium	<	4	U	5.2		J
Calcium	97600			63600		
Magnesium	20300		J	14900		
Potassium	9840		J	7600		
Selenium	1.6		J	<	2	UJ
Sodium	26700		J	22100		
Vanadium	12.3			15.4		
TPH (mg/L)						
Total Petroleum Hydrocarbons				1.2	1	
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	61.4			59.9	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	61.4			59.9	5	
Chloride	54.2			36.9	3	
Fluoride	0.32			0.11	0.1	
Nitrate plus Nitrite as N	12.2			7.8	0.5	
Sulfate	184			128	5	
Total Dissolved Solids	521			406	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 26

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-8

Locator/Sample Round	OU3-BPW8-RGW-001			OU3-BPW8-RGW-002		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Trichloroethene	0.3		J	<	0.38	U
Metals (µg/L)						
Barium	48.5			54.3		
Calcium	94600			104000		
Magnesium	25800			28000		
Potassium	8640			9420		
Sodium	32100			29800		
Vanadium	9.4			10.6		
Zinc	28.2 .			<	19	U
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	79.7	5		80.7	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	79.7	5		80.7	5	
Chloride	70.7	3		72.9	3	
Fluoride	0.13			<	0.1	U
Nitrate plus Nitrite as N	12.9	1		15.7	1	
Sulfate	192	5		199	5	
Total Dissolved Solids	584	10		664	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 27

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT BPW-9

Locator/Sample Round	BPW9-RGW-001			OU3-BPW9-RGW-002			OU3-BPW9-RGW-003			OU3-BPW9-RGW-004		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)												
Trichloroethene	1.6			2.4			2.4	0.35		3		NJ
Semivolatile Organics (µg/L)												
bis(2-Ethylhexyl) phthalate	<	10	U	1		J				2		J
Pentachlorophenol	0.65		J	<	0.65	U	<	25	U	<	25	U
Metals (µg/L)												
Barium	17.2			18.1								
Calcium	45300		J	44600								
Copper	35.2		J	<	9.7	U						
Iron	978			<	54.1	U						
Lead	7.3		J	<	1	UJ						
Magnesium	14600		J	14000								
Manganese	18.8			<	4	U						
Nickel	<	7	U	3.3								
Potassium	6420			5070								
Sodium	22500			19600								
Vanadium	12.5			11.6								
Zinc	840			178								
Water Quality (mg/L)												
Alkalinity, Total as CaCO3 at pH 4.5	100			101	5							
Alkalinity, Bicarb. as CaCO3 at pH 4.5	100			101	5							
Chloride	25.7			24.6	3							
Fluoride	0.15											
Nitrate plus Nitrite as N	4.6			4.4	0.02							
Sulfate	62.6			55.4	5							
Total Dissolved Solids	284			307	10							
Orthophosphate as P	<	0.05	UJ	0.079	0.05							

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.
N = Presumptively present.

TABLE 28

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT 30I

Locator/Sample Round	OU3-30I-RGW-002		
	Result	RL	Qual
Metals (µg/L)			
Barium	9.8		
Calcium	26600		
Chromium	7.3		
Magnesium	8560		
Manganese	4		
Nickel	3.8		
Potassium	3800		
Sodium	14300		
Vanadium	19.3		
Water Quality (mg/L)			
Alkalinity, Total as CaCO3 at pH 4.5	67.7	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	67.7	5	
Chloride	13.4	3	
Fluoride	0.14	0.1	
Nitrate plus Nitrite as N	3.8	0.2	
Sulfate	31.8	5	
Total Dissolved Solids	202	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 29

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT 31ABA1

Locator/Sample Round	OU3-31ABA1-RGW-002			OU3-31ABA1-RGW-003		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Tetrachloroethene	1	0.39	J	<	0.39	U
Trichloroethene	1	0.38	J	0.21	0.35	J
Metals (µg/L)						
Arsenic	2.8					
Barium	20.1					
Calcium	52100					
Lead	4.2		J			
Magnesium	16300					
Potassium	5800					
Sodium	28100					
Vanadium	12.5					
TPH (mg/L)						
Total Petroleum Hydrocarbons	1.3	1				
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	142	5				
Alkalinity, Bicarb. as CaCO3 at pH 4.5	142	5				
Chloride	34.1	3				
Fluoride	0.13	0.1				
Nitrate plus Nitrite as N	5.5	0.2				
Orthophosphate as P	0.056	0.05				
Sulfate	47.5	5				
Total Dissolved Solids	356	10				

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 30

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT 36AAAA

Locator/Sample Round	OU3-36AAA-RGW-001		
	Result	RL	Qual
Metals (µg/L)			
Antimony	68.5		
Arsenic	1.2		
Barium	10.7		
Calcium	12700		
Chromium	7.3		
Magnesium	3680		
Potassium	3160		
Sodium	9970		
Vanadium	22.6		
Water Quality (mg/L)			
Alkalinity, Total as CaCO3 at pH 4.5	57.9	5	
Alkalinity, Bicarb. as CaCO3 at pH 4.5	57.9	5	
Chloride	3	3	
Fluoride	0.15	0.1	
Nitrate plus Nitrite as N	1.1	0.1	
Sulfate	6.7	5	
Total Dissolved Solids	116	10	

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 31

SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER SAMPLES AT 5ACCI

Locator/Sample Round	OU3-5ACC1-RGW-002			OU3-5ACC1-RGW-003		
	Result	RL	Qual	Result	RL	Qual
Volatile Organics (µg/L)						
Acetone	7		J	<	10	UJ
Methylene Chloride	1		J	<	10	U
Metals (µg/L)						
Calcium	53400					
Magnesium	16300					
Potassium	6320					
Sodium	21000					
Vanadium	12.5					
TPH (mg/L)						
Total Petroleum Hydrocarbons	1	1				
Water Quality (mg/L)						
Alkalinity, Total as CaCO3 at pH 4.5	88.4	5				
Alkalinity, Bicarb. as CaCO3 at pH 4.5	88.4	5				
Chloride	36.9	3				
Fluoride	0.1	0.1				
Nitrate plus Nitrite as N	7.5	0.5				
Sulfate	71.6	5				
Total Dissolved Solids	352	10				

Results presented here are only those chemicals which were detected at least once in this well and have passed data review.
RL = Reporting Limit
Qual = Qualifier
J = Estimated value.
R = Rejected value.
U = Nondetected value.

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	DP-09(3)	DP-18(3)	FT-07B(3)	FT-07C(3)	LF-02(2)		LF-23(3)	OT-16(1)
					D**	TR		
Metals								
Antimony								5.5 J
Arsenic	4.8 J	18.8	14.7	12.6	38.1	10.5	8.9 J	
Barium					406			
Beryllium					1.74		1.1	
Cadmium	0.84			0.73		1.47	0.74	
Chromium					44		24.2	
Cobalt								
Copper					173 J		20.7	24.53
Lead			24.5		133 J	157.2		
Mercury					0.57	0.62	0.41	
Nickel							25.4	
Silver	1.3							
Vanadium							46.4	
Zinc			95.2		1403	1176.2	65.5	79.31
VOCs								
1,1-Dichloroethane			0.0028 J	0.0019 J				
1,1,1 Trichloroethane								
1,2-Dichloroethane		0.004 J	0.046	0.026				
1,1-Dichloroethene								
1,2 Dichloroethene			0.0016 J					
1,1,2-Trichloroethane			0.0023 J					
2-Butanone			0.0086 J			0.009		0.007
Acetone			32	0.031				0.01
Benzene			0.0035 J	0.0023 J				
Carbon disulfide								
Chloroform			0.0085 J	0.0071				
Chlorobenzene								
Dibromochloromethane								

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	DP-09(3)	DP-18(3)	FT-07B(3)	FT-07C(3)	LF-02(2)		LF-23(3)	OT-16(1)
					D**	TR		
Ethylbenzene			0.0018 J			0.002 J		
Methylene Chloride					0.03	0.013		0.002 J
Styrene			31			0.001 J		
Tetratchloroethene			0.0032 J	0.0013 J	0.001 J	0.002 J		
Toluene			0.18	0.037	0.017	0.008		0.004
Trichloroethene			0.0051 J	0.0038 J	0.006	0.005		
Xylenes (total)			0.061 J		0.005	0.005		
SVOCs								
1,4-Dichlorobenzene						1.544		
2,4-Dichlorophenol						0.224		
2,4-Dimethylphenol								
2-Methylphenol								
4-Methyl phenol								
4-Nitrophenol								
Benzoic Acid							0.066 J	
bis(2-ethylhexyl)phthalate			4.7 J		0.11			
Butylbenzylphthalate						0.213		
Carbazole					0.1 J	0.196	0.49	
Di-n-butylphthalate					0.044 J	0.079 J		
Dibenzofuran						0.044 J	0.27 J	
Diethylphthalate						0.086 J		
Hexylphthalate								
N-nitrosodiphenylamine			2.8 J					
Phenol								
PAHs								
2-Methylnaphthalene			20			0.053 J	0.11 J	

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	DP-09(3)	DP-18(3)	FT-07B(3)	FT-07C(3)	LF-02(2)		LF-23(3)	OT-16(1)
					D**	TR		
Acenaphthene						0.08 J	0.68	
Anthracene					0.083 J	0.193	0.75	
Benzo(a)anthracene					0.673	1.458	1.7	2.122
Benzo(a)pyrene					0.595	0.283	1.3	2.1
Benzo(b)fluoranthene					0.878	1.473	1.7	2.308
Benzo(b,h)perylene								
Benzo(g,h,i)perylene					0.045	1.082	0.66	
Benzo(k)fluoranthene					0.49	0.257	0.83	
Chrysene					0.687	1.46	1.7	2.139
Dibenzo(a,h)anthracene						0.17 J	-	
Fluoranthene					0.867	1.572	3.33	1.978
Fluorene						0.094 J	0.55	
Ideno (1,2,3-c,d) pyrene					0.1 J	0.234	0.65	0.099
Naphthalene						0.193	0.28 J	
Phenanthrene					0.34	1.507	3.33	
Pyrene					0.649	1.47	0.41	2.347
TPH								
TRPH			8720	2640	886	3970		653.23
Pesticides								
2,4-D						6.5		
4,4-DDD					0.041	0.042		
4,4-DDE					0.381	0.065		
4,4-DDT					0.995	0.032		
Aldrin								
alpha-Chlordane						0.014		

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	DP-09(3)	DP-18(3)	FT-07B(3)	FT-07C(3)	LF-02(2)		LF-23(3)	OT-16(1)
					D**	TR		
Dieldrin						0.011 J		
Endrin						-		
gamma-Chlordane						0.016		
Heptachlor								
Heptachlor epoxide								
Herbicide								
MCPP								
PCBs								
Aroclor-1242						0.134		
Aroclor-1254					0.271	0.2		
Aroclor-1260						0.041		

D - Drum Disposal Area TR - Trench Area

J -Estimated Value

* - Sediment Samples Included In SD-25 Sediment Data

x - Represents Surface Soil Sample Data

** - Samples contained @ 1/3 coal ash and 2/3 soil, which has been considered representative of the Ash Disposal Area also

Sources: 1 W-C 1993a 3 W-C 1992b
2 W-C 1992a

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	SD-12(1)	SD-24*(1)	SD-27*(1)	SS-28(3)	SS-29(1)	ST-11(1)	ST-34(1)
Metals							
Antimony			0.66 J				7.6 J
Arsenic			5.94	4.6 J			4.86
Barium			516.14		1097.63		
Beryllium				1.2			
Cadmium		1.09	1.9	1.1	122.06		1.09
Chromium			38.7	22.1	43.58		
Cobalt			22.71				
Copper			26.75	34.1			23.43
Lead		91.6	82		135.7	10.1	91.43
Mercury							
Nickel				23.4			
Silver							
Vanadium				43.6			
Zinc			283.08	74.5	162		66.35
VOCs							
1,1-Dichloroethane					0.0025 J		
1,1,1 Trichloroethane					0.0095		
1,2-Dichloroethane							
1,1-Dichloroethene	0.002 J				0.025 J		
1,2 Dichloroethene		3.88					
1,1,2-Trichloroethane							
2-Butanone	0.0056	0.008			0.004 J		
Acetone	0.011	0.009	3.844			0.254 J	
Benzene							
Carbon disulfide			0.006 J				
Chloroform							
Chlorobenzene	0.002 J						
Dibromochloromethane		0.001 J					7.501

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	SD-12(1)	SD-24*(1)	SD-27*(1)	SS-28(3)	SS-29(1)	ST-11(1)	ST-34(1)
Ethylbenzene			0.02				
Methylene Chloride	0.002 J	0.004	0.022	0.005 J	0.003 J		
Styrene							
Tetratchloroethene			0.002 J		0.0033 J	11.8	10.72
Toluene	0.002 J	3.974	0.102		0.0074		
Trichloroethene	0.002 J	136	0.003 J	0.017	0.0061	106	139.2
Xylenes (total)		3.18	0.259		0.002 J	106	139.2
SVOCs							
1,4-Dichlorobenzene							
2,4-Dichlorophenol							
2,4-Dimethylphenol		27.2					
2-Methylphenol		5.5 J					
4-Methyl phenol		6.7 J	1.1				
4-Nitrophenol		3.35 J					
Benzoic Acid		0.1 J					
bis(2-ethylhexyl)phthalate		1.3	2.406		0.865		
Butylbenzylphthalate		0.065	2.4 J		0.54		
Carbazole		0.091	3 J		1.192		
Di-n-butylphthalate					0.53		
Dibenzofuran							
Diethylphthalate	0.064		0.54 J				
Hexylphthalate		1.3 J					
N-nitrosodiphenylamine							
Phenol		6.3					
PAHs							
2-Methylnaphthalene							

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	SD-12(1)	SD-24*(1)	SD-27*(1)	SS-28(3)	SS-29(1)	ST-11(1)	ST-34(1)
Acenaphthene			2.4 J		0.723		
Anthracene			2.834		0.911		
Benzo(a)anthracene		0.31	7.468		3.146		
Benzo(a)pyrene		0.33 J	7.466		5.449		
Benzo(b)fluoranthene	0.041	0.74	12.186		12.495		
Benzo(b,h)perylene							
Benzo(g,h,i)perylene		0.42	4.865				
Benzo(k)fluoranthene	0.048		3.807		0.42		
Chrysene		0.43	7.454		6.243		
Dibenzo(a,h)anthracene		0.092 J	4.253		0.58		
Fluoranthene	0.04	0.8	17.608		12.993		
Fluorene			1.267		0.763		
Ideno (1,2,3-c,d) pyrene		0.31 J	4.966		2.73		
Naphthalene			1.8		0.053 J		
Phenanthrene		0.51 J					
Pyrene	0.045	5.6	14.012		11.261		
TPH							
TRPH		7099	3083.12		1874.78		
Pesticides							
2,4-D							
4,4-DDD	0.326		0.113 J				
4,4-DDE	0.098		0.048				
4,4-DDT	0.691		0.01 J				
Aldrin	0.052						
alpha-Chlordane	0.322		0.03 J				

TABLE 38

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SOILS (mg/kg)
RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analyte	SD-12(1)	SD-24*(1)	SD-27*(1)	SS-28(3)	SS-29(1)	ST-11(1)	ST-34(1)
Dieldrin	1.12		0.024 J				
Endrin			0.027 J				
gamma-Chlordane	0.299		0.022 J				
Heptachlor	0.084						
Heptachlor epoxide			0.023				
Herbicide							
MCPP	94.00						
PCBs							
Aroclor-1242							
Aroclor-1254							
Aroclor-1260							

D - Drum Disposal Area TR - Trench Area
J -Estimated Value
* - Sediment Samples Included In SD-25 Sediment Data
x - Represents Surface Soil Sample Data
** - Samples contained @ 1/3 coal ash and 2/3 soil, which has been considered representative of the Ash Disposal Area also
Sources: 1 W-C 1993a 3 W-C 1992b
2 W-C 1992a

TABLE 39

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SURFACE WATER (mg/kg) RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analytes	LF-01 (2)	SD-25 (1)
Metals		
Aluminum		
Arsenic		
Barium		
Beryllium		
Cadmium		
Chromium		
Cobalt		
Copper		
Lead		
Mercury		
Nickel		
Silver		
Vanadium		
Zinc		0.167
VOCs		
1,1-Dichloroethane		
1,1,1 Trichloroethane		
1,2-Dichloroethane		
1,2 Dichloroethene		
1,1,2-Trichloroethane		
2-Butanone	0.005	0.004 J
Acetone		0.070
Benzene	0.004	
Bromodichloromethane		0.001 J
Carbon disulfide		
Chloroform		
Dibromochloromethane		0.003 J
Ethylbenzene		
Methylene Chloride		
Styrene		
Tetratchloroethene		
Toluene		0.002 J
Trichloroethene		
Xylenes (total)		0.004 J

TABLE 39

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SURFACE WATER (mg/kg) RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analytes	LF-01 (2)	SD-25 (1)
SVOCs		
1,2 Dichlorobenzene	0.005	
1,4-Dichlorobenzene		
2,4-Dichlorophenol		
2,4-Dimethylphenol		
3,3-Dichlorobenzidine		
4-methyl phenol	0.005	0.027
Benzoic Acid		
bis (2-ethylhexyl) phthalate	0.025	
Butylbenzylphthalate		
Carbazole		
Di-n-butylphthalate		
Di-n-octylphthalate		0.002 J
Dibenzofuran		
N-nitrosodiphenylamine		
Pentachlorophenol		0.004 J
Phenol	0.005	0.008
PAHs		
2-Methylnaphthalene		0.002 J
Acenaphthene		
Anthracene		
Benzo (a) anthracene		
Benzo (a) pyrene		
Benzo (b) fluoranthene		
Benzo (g,h,i) perylene		
Benzo (k) fluoranthene		
Chrysene		
Dibenzo (a,h) anthracene		
Fluoranthene		
Fluorene		
Indeno (1,2,3-c,d) pyrene		
Naphthalene	0.007	0.002 J
Phenanthrene		
Pyrene		
TPH		
TRPH		

TABLE 39

SUMMARY OF BASE-WIDE CHEMICALS OF CONCERN IN SURFACE WATER (mg/kg) RME CONCENTRATIONS OF METALS ABOVE BACKGROUND AND DETECTED ORGANIC COMPOUNDS

Analytes	LF-01 [2]	SD-25 [1]
Pesticides		
4,4-DDD		
4,4-DDE		
4,4-DDT		
Aldrin		
alpha-Chlordane		
beta-BHC		
Dieldrin		
gamma-Chlordane		
Heptachlor		
Heptachlor epoxide		
Herbicide		
MCPP		
PCBs		
Aroclor-1242		
Aroclor-1254		
Aroclor-1260		

J Estimated value

Sources:
[1] W-C 1993
[2] W-C 1992a