Final
Resource Conservation Recovery Act Facility Investigation
Training Area T-6 (Naylor Field), Parcel 183(6) and
Cane Creek Training Area, Parcel 510(7)
McClellan
Anniston, Alabama

Prepared for:

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LIST OF ABBREVIATIONS AND ACRONYMS

°C	Degrees Centigrade
°F	Degrees Fahrenheit
1,1,1,2-PCA	1,1,1,2-Tetrachloroethane
1,1,2-TCA	1,1,2-Trichloroethane
1,1,2,2-PCA	1,1,2,2-Tetrachloroethane
1,2-DCA	1,2-Dichloroethane
ADEM	Alabama Department of Environmental Management
amsl	above mean sea level
Army	United States Department of the Army
ATSDR	Agency for Toxic Substances and Disease Registry
ASTM	American Society for Testing and Materials
bgs	below ground surface
Bhate	Bhate Environmental Associates, Inc.
BRAC	Base Realignment and Closure
CA	Cleanup agreement
CDTF	Chemical Defense Training Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CFDP	Center for Domestic Preparedness
cis-1,2-DCE	cis-1,2-Dichloroethene
COC	Constituent of concern
COPC	Constituent of potential concern
COPEC	Constituents of potential ecological concern
CWM	Chemical weapons material
DANC	Decontamination agent, non-corrosive
DO	Dissolved oxygen
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DQS	Data Quality Summary
DS2	Decontamination Solution Number 2
EBS	Environmental Baseline Study
EE/CA	Engineering Evaluation/Cost Analysis
EMAX	EMAX Laboratories
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
ESCA	Environmental Services Cooperative Agreement
ESE	Environmental Science & Engineering, Inc.
ESMP	Endangered Species Management Plan
ESV	Ecological screening value
FOSET	Finding of Suitability for Early Transfer
FOST	Finding of Suitability for Transfer
ft/ft	feet per foot
GB	Sarin
GC/MS	Gas Chromatography/Mass Spectrometry

HD	Distilled mustard
HGS	HGS Engineering, Inc.
HI	Hazard index
HQ	Hazard quotient
IDW	Investigation Derived Waste
ILCR	Incremental lifetime cancer risk
IT	IT Corporation
JPA	Joint Powers Authority
L	Lewisite
LFS	Low flow groundwater sampling
McClellan	McClellan, Anniston, Alabama
MDC	Maximum detected concentration
MDL	Method detection limit
MES	Matrix Environmental Services, LLC
MINICAMS	miniature continuous air monitoring system
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
ml	milliliters
NFA	No Further Action
NOAEL	no-observed-adverse-effect-levels
ORP	Oxidation-reduction potential
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PID	Photo ionization detector
QAP	Quality Assurance Plan
RCRA	Resource Conservation Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SAIC	Science Applications International Corporation
SAP	*Sampling and Analysis Plan*
Shaw	Shaw Environmental, Inc.
SI	Site investigation
SINA	Special interest natural areas
SSSL	Site-Specific Screening Level
STB	Supertropical bleach
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TOC	Total Organic Compound
trans-1,2-DCE	trans-1,2-Dichloroethene
UCL	Upper confidence limit
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA) has assumed the responsibility for environmental closure of certain sites at McClellan from the U.S. Department of the Army (Army). Transfer of these sites to the JPA was conducted pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120(h)(3)(C) which allows federal agencies to transfer contaminated property before all necessary cleanup has taken place. The basis for the continuing effort at these parcels is the execution of an Environmental Services Cooperative Agreement (ESCA) dated September 29, 2003 between the JPA and the Army (Army, 2003), and a Cleanup Agreement (CA), amended September 2005 and June 2006, between the JPA and the Alabama Department of Environmental Management (ADEM).

Training Area T-6 (Naylor Field), Parcel 183(6) (Training Area T-6) is currently a vacant parcel, which was formerly used by the Army sometime prior to 1954 and continuing through 1973. Training Area T-6 contained eight training sites, consisting of concrete pads and a network of drainage ditches where chemical weapons material (CWM) decontamination exercises were performed on surplus vehicles. Cane Creek Training Area, Parcel 510(7) (Cane Creek Training Area), is currently a vacant parcel adjacent to Training Area T-6 and was formerly used for training classes in equipment decontamination procedures.

Previous investigations at Training Area T-6 were conducted by Shaw Environmental, Inc. (Shaw) and included a site investigation (SI) from October through December 2001, and a remedial investigation (RI) from October 2002 through March 2003. An SI was conducted at Cane Creek Training Area from October 2002 through March 2003, concurrent with the Training Area T-6 RI. Results of these investigations indicated that groundwater contamination in the form of chlorinated volatile organic compounds (VOCs) was present and was likely a product of decontamination agents used during CWM training activities (Shaw, 2004). The horizontal and vertical extents of contaminated groundwater were not fully defined in the SI or RI. The most recent environmental investigations of Training Area T-6 and Cane Creek Training Area (collectively referred to as the Site) were performed by MES, on behalf of JPA, as part of a Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) from March 2004 through May 2004, and from August 2005 through October 2005 to further characterize the parcels and fill data gaps that existed from the previous environmental investigations. This RFI report includes summaries of past environmental investigations performed at the Site as well as a summary of investigative procedures and results obtained during the 2004/2005 environmental investigation.

Activities for the 2004/2005 RFI at the Site included:

- Installation of seven monitoring wells (three in 2004 and four in 2005).
- Groundwater level measurements.
- Sampling, analysis, and data quality review of 42 groundwater samples, 6 surface water samples, six sediment samples, five surface soil samples, and one depositional soil sample.
- Evaluation of nature and extent of contamination.
- Evaluation of fate and transport of contamination.

- Human health and ecological risk assessments.

A general understanding of natural conditions at the Site was necessary when evaluating the nature and extent, fate and transport, and risk presented as a result of Site contamination. The following is a brief synopsis of geology and hydrogeology observed at the Site.

Groundwater flow within the residuum generally conforms to surface topography and flows predominately to the northeast towards South Branch of Cane Creek. Groundwater flow in the bedrock water-bearing zone tends to demonstrate convergent flow along the estimated limestone strike towards the northeast, where it gradually turns to the north near South Branch of Cane Creek. In addition, the South Branch of Cane Creek appears to act as a discharge point for residuum and bedrock groundwater.

The groundwater, surface water, and sediment samples collected during the 2004/2005 RFI were analyzed for volatile organic compounds (VOCs); in addition, one groundwater sample was also analyzed for metals. Five surface soil and one depositional soil samples were analyzed for metals.

Twenty VOCs were detected in the groundwater samples, three VOCs were detected in the surface water samples, and three VOCs were detected in the sediment samples. Trichloroethene was the primary constituent detected in the groundwater, surface water, and sediment samples.

To evaluate the nature and extent of contamination at the Site, the VOC and metal results were assessed to identify the constituents of potential concern (COPCs) at the Site. Historical VOC, SVOC, CWM breakdown product, and metal results from the investigations performed by Shaw in 2001 and 2003 were also assessed.

1,1,1,2-Tetrachloroethane (1,1,1,2-PCA), 1,1,2,2-tetrachloroethane (1,1,2,2-PCA), 1,1,2-trichloroethane (1,1,2-TCA), 1,2-dichloroethane (1,2-DCA), acetone, bromodichloromethane, chloroform, cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethene (PCE), trans-1,2-dichloroethene (trans-1,2-DCE), trichloroethene (TCE), vinyl chloride, nickel, and thallium exceeded the residential SSSLs in groundwater. The highest concentrations of VOCs in groundwater were found in wells located in the vicinity of the trenches and concrete pads (i.e., estimated source area), and a general decrease in VOC concentrations was indicated in wells downgradient from the estimated source area.

The presence of 4-,3-,2- and single-chlorine compounds in groundwater at the Site indicates that anaerobic degradation of chlorinated solvents is occurring at the source area and at locations throughout Training Area T-6 and Cane Creek Training Area.

1,1,2,2-PCA and vinyl chloride exceeded the recreational SSSLs, and vinyl chloride exceeded the ecological screening value (ESV) in surface water. Vinyl chloride and bis(2-ethylhexyl)phthalate exceeded ESVs in sediment. Antimony and zinc exceeded the residential SSSLs, and 1,1,2,2-PCA, chloroform, styrene, PCE, TCE, hexachlorobenzene, pentachlorophenol, antimony, mercury, nickel, and zinc exceeded ESVs in surface and depositional soil. 1,1,2,2-PCA exceeded the residential SSSL, and 1,1,2,2-PCA, chloroform,

PCE, TCE, and vinyl chloride exceeded ESVs in subsurface soil.

Based on the results of the 2004/2005 RFI and data collected during previous investigations, no further environmental data collection is required to define the nature and extent of contamination at the Site.

Site contamination did not appear to be a result of release into surface water, and surface water is not considered a main source for contamination. Based on the Site history and an understanding of the contamination involved, the most likely methods of transport are volatilization and subsequent degradation in air, and infiltration to groundwater.

A human health risk assessment was performed to evaluate the potential threat to human health from exposure to environmental media at the Site. The receptor scenario that was evaluated based on future land use was residential. The human health risk assessment at the Site consisted of selecting the COPCs, identifying the exposure point concentrations (EPCs) for the COPCs, identifying the constituents of concern (COCs), calculating the incremental lifetime cancer risk (ILCR) and non-cancer hazard index (HI), and identifying the total cancer risk and total non-cancer hazard index. The following is a summary of results from the human health risk assessment.

- Groundwater at the Site presents an increased cancer-based risk to the residential receptor. Groundwater cancer-based COCs for the residential receptor were identified as 1,1,1,2-PCA, 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, bromodichloromethane, PCE, TCE, and vinyl chloride. Non-cancer COCs for the resident in groundwater were identified as 1,1,2,2-PCA, 1,1,2-TCA, acetone, chloroform, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, nickel and thallium.

- Surface water at the Site presents an increased cancer-based risk to the recreational user. The cancer-based COC for the recreational user in surface water was identified as vinyl chloride. No constituents were considered non-cancer hazards for the recreational user exposed to surface water at the Site.

- No constituents were considered cancer risks for the resident in surface and depositional soil at the Site. Only antimony was identified as a non-cancer COC for the resident in surface and depositional soil.

- 1,1,2,2-PCA was identified as a cancer-based COC for the resident and groundskeeper in subsurface soil. However, because 1,1,2,2-PCA was detected in subsurface soil samples at depths of 10 feet or greater, there is no complete exposure pathway for the resident and groundskeeper and subsurface soil. Therefore, 1,1,2,2-PCA in subsurface soil is not considered an increased cancer-based risk to the resident or groundskeeper. No constituents were considered non-cancer hazards for the receptor exposed to subsurface soil.

- Because no constituents exceeded the recreational user SSSLs in sediment, no constituents were considered risks for the recreational user exposed to sediment.

- Chlorinated VOCs in groundwater are responsible for cancer risks and non-cancer hazards exceeding acceptable levels.

An ecological risk assessment was conducted to evaluate the potential for ecological risks posed by site-related constituents at the Site. The ecological risk assessment for the Site consisted of selecting the COPCs, identifying the EPCs for the COPCs, calculating the screening-level hazard quotients (HQs), identifying the COCs, and assessing the COCs in relation to the environmental setting and habitat(s) in and around the Site.

Vinyl chloride was identified as a COC in sediment; chloroform, TCE, and zinc were identified as COCs in surface and depositional soil; and 1,1,2,2-PCA, chloroform, and TCE were identified as COCs in subsurface soil. These constituents may pose an increased risk to ecological receptors due to Site activities.

Vinyl chloride was identified as a COC in surface water; bis(2-ethylhexyl)phthalate was identified as a COC in sediment; 1,1,2,2-PCA, antimony, and mercury were identified as COCs in surface and depositional soil. However, with each constituent exhibiting only one or two sample detects above the ESV, and with HQs less than ten, these constituents most likely do not pose a significant ecological risk.

The HQ values for hexachlorobenzene and pentachlorophenol in surface and depositional soil were high (above 10), however, because they were detected at only one location, they were not considered to be wide-spread contaminants and were not considered to pose significant risk to ecological populations at the Site.

PCE was identified as a COC in subsurface soil. However, because PCE exceeded the ESV in only one subsurface soil sample location at a depth greater than 10 feet below ground surface (bgs), and the HQ for PCE in subsurface soil was below 10, PCE is not considered an ecological risk in subsurface soil at the Site.

Groundwater, surface water, sediment, surface and depositional soil and subsurface soil contamination present risk to both human health and the environment at levels sufficient to warrant a combination of remediation and risk management decisions. The JPA recommends that a groundwater remediation program be developed for the Site, beginning with an evaluation of appropriate remedial technologies. This evaluation will be performed in accordance with the appropriate requirements of both the ESCA and the CA. Based on the results of this RFI, the remedies that would be considered would include no action, monitored natural attenuation, in-situ chemical remediation, enhanced in-situ bioremediation, reactive permeable barrier, and groundwater extraction and treatment.

1.0 INTRODUCTION

Matrix Environmental Services, LLC (MES) has prepared this Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) Report to summarize environmental investigations relevant to Training Area T-6 (Naylor Field), Parcel 183(6) (Training Area T-6), and Cane Creek Training Area, Parcel 510(7) (Cane Creek Training Area), within McClellan, Anniston, Alabama, formerly known as Fort McClellan. These two parcels will be collectively referred to as the Site in this report. Figure 1-1 shows a map of McClellan. Figure 1-2 shows a parcel location map of the Site.

This report was written on behalf of the Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA), which has assumed the responsibility for environmental closure of certain sites at McClellan from the United States (U.S.) Department of the Army (Army). Transfer of these sites to the JPA was conducted pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120(h)(3)(C) which allows federal agencies to transfer contaminated property before all necessary cleanup has taken place. The basis for the continuing effort at these parcels is an Environmental Services Cooperative Agreement (ESCA) between the JPA and the Army originally executed September 2003 (Army, 2003) and amended in September 2005 and June 2006. In addition, the JPA has negotiated a Cleanup Agreement (CA), amended November 2005, with the Alabama Department of Environmental Management (ADEM) that describes the responsibilities of both parties in completing the investigation and remediation of potentially impacted sites at McClellan (ADEM, 2003).

This report was prepared at the direction of the JPA for the exclusive use of the JPA and ADEM in fulfilling requirements of the CA. No other party should rely on the information contained herein without prior written consent of the JPA and MES. Data and observations presented in this report represent conditions in existence at the specific locations and depths investigated, and may not reflect conditions existing at other depths, locations, or times. This RFI Report and associated work were performed in accordance with the principles and practices generally employed by the environmental consulting profession. No warranties, expressed or implied, are made regarding the conditions of the Site.

1.1 Status of the Site and Justification for Environmental Investigation

Training Area T-6 was used by the Army for training exercises sometime prior to 1954 and continuing through 1973 and is currently a vacant parcel occupying approximately 10 acres. Training Area T-6 is west of Fox Road in the western-central portion of McClellan. Decontamination of chemical weapons material (CWM) was performed on surplus vehicles at eight training sites within Training Area T-6 during routine military exercises. The training sites consisted of concrete pads and a network of drainage ditches, where the decontamination agents and CWM were rinsed and collected (Shaw Environmental, Inc. [Shaw], 2004). Proposed future land use of this parcel is for an educational campus as proposed in the Re-Use Plan (November 1997 [EDAW, 1997] as amended by the JPA in June 2005).

The Cane Creek Training Area is currently a vacant parcel located adjacent to Training Area T-6,

northeast across Fox Road, and south of Derby Street in the west-central portion of McClellan. Cane Creek Training Area is approximately 2 acres in size and straddles the South Branch of Cane Creek. In 1958, this area was reportedly used for training in decontamination procedures of military equipment. It is unknown if toxic agents were used in this area (Shaw, 2004). The proposed future land use of this parcel is passive recreation (part of the McClellan Park System), as proposed in the Re-Use Plan (EDAW, 1997 [as amended by the JPA in June 2005]).

Previous investigations at Training Area T-6 were conducted by Shaw Environmental, Inc. (Shaw) and included a site investigation (SI) from October through December 2001, and a remedial investigation (RI) from October 2002 through March 2003. An SI was also conducted at Cane Creek Training Area from October 2002 through March 2003, concurrent with the Training Area T-6 RI. Results of these investigations indicated that groundwater contamination in the form of chlorinated volatile organic compounds (VOCs) was present and was likely a product of decontamination agents used during CWM training activities (Shaw, 2004). The horizontal and vertical extents of contaminated groundwater were not fully defined in the SI or RI. In addition, VOCs were detected in sediments and surface water collected near the Cane Creek Training Area. Therefore, MES performed a two-phase RFI at Training Area T-6 and Cane Creek Training Area, on behalf of JPA. The investigation was conducted from March through May 2004 and from August through October 2005 (2004/2005 RFI). The purpose of this investigation was to further characterize the Site and fill data gaps existing from previous environmental investigations. This RFI report presents the data and results of the 2004/2005 RFI and includes summaries of past environmental investigations performed at the Site.

1.2 McClellan Site Description and History

McClellan is located in the foothills of the Appalachian Mountains of northeastern Alabama, near the cities of Anniston and Weaver in Calhoun County (Figure 1-1). McClellan is approximately 60 miles northeast of Birmingham, 75 miles northwest of Auburn, and 95 miles west of Atlanta, Georgia.

The U.S. government purchased 18,929 acres of land near Anniston in 1917 for use as an artillery range and a training camp in response to the outbreak of World War I. The site was named Camp McClellan in honor of Major General George B. McClellan, a leader of the Union Army during the Civil War. Camp McClellan was used to train troops for World War I from 1917 until the armistice when it was designated as a demobilization center. Between 1919 and 1929, Camp McClellan served as a training area for active army units and other civilian elements. In 1929, Camp McClellan was re-designated as Fort McClellan and continued to serve as a military training area.

In 1940, the government acquired an additional 22,245 acres west of McClellan and named this tract of land Pelham Range. In 1941, the Alabama Legislature leased approximately 4,488 acres to the U.S. government to provide an access corridor from the Main Post to Talladega National Forest. This corridor provides access to additional woodlands used for military training.

The Army operated the Chemical Defense Training Facility (CDTF) at Fort McClellan from 1951 until the school was deactivated in 1973. The CDTF was then reactivated in 1979 and was

closed at the time of base closure in 1999 (Environmental Science & Engineering, Inc. [ESE], 1998). The CDTF offered advanced training in all phases of chemical, biological, and radiological warfare to personnel from all branches of the military.

In 1995, the U.S. Department of Defense announced that Fort McClellan would close by October 1999. The Base Realignment and Closure (BRAC) commission recommended closure of Fort McClellan, except for minimum essential land and facilities for a Reserve Component Enclave and essential facilities needed to provide support for the chemical demilitarization operation at the Anniston Army Depot. Subsequently, the U.S. Department of Justice (DOJ) requested a transfer of some facilities and training areas to their authority for ongoing training exercises. The Army transferred the CDTF and ancillary support facilities to the DOJ in 2000 to establish the Center for Domestic Preparedness (CFDP).

Property that was determined by the Army and ADEM to be suitable for transfer (i.e., "clean property") was transferred to the JPA under a Finding of Suitability for Transfer (FOST). Subsequently, remaining contaminated property was transferred to the JPA under a Finding of Suitability for Early Transfer (FOSET). The basis for the continuing effort at these FOSET parcels is the execution of an ESCA and the CA that describe the responsibilities of all parties in completing the investigation and remediation of potentially impacted sites at McClellan.

1.3 Purpose and Objectives

The purpose of this RFI Report is to summarize environmental sampling data from previous investigations and to present analytical results for the 2004/2005 RFI. Objectives for the 2004 and 2005 field activities as part of the RFI were to:

(1) Further define vertical and horizontal extent of groundwater contamination.
(2) Obtain additional information regarding area hydrogeology.
(3) Determine the presence of VOCs in sediment and surface water.
(4) Determine the presence of metals in surface and depositional soil.
(5) Collect additional information to fill data gaps that existed from previous investigations.

1.4 Report Organization

Section 2.0 of this report presents a summary of the environmental setting including location, soil types, geology, and hydrogeology of the parcels. Section 3.0 presents a summary of previous environmental investigations. Section 4.0 describes the activities conducted during the 2004/2005 RFI, and Section 5.0 presents the results of the 2004/2005 RFI. Contaminant fate and transport is discussed in Section 6.0. Screening-level human health and ecological risk discussions are presented in Sections 7.0 and 8.0, respectively. Section 9.0 presents the summary, conclusions, and recommendations. Section 10.0 provides the references cited in this report.

Additional supporting information is provided in Appendices included with this report, as follows:

Appendix A Monitoring Well Installation Documentation Forms for 2004/2005 RFI Wells
A1: Boring Logs for 2004/2005 RFI Wells
A2: Well Completion Data for 2004/2005 RFI Wells
A3: Well Development Forms for 2004/2005 RFI Wells
A4: Slug Test Data
Appendix B Field Documentation Forms for 2004/2005 RFI
B1: Monitoring Well Sample Collection Forms for 2004/2005 RFI Wells
B2: Chain of Custody Forms for 2004/2005 RFI Wells
Appendix C Analytical Data for 2004/2005 RFI

Appendix D *Data Quality Summary: Small Weapons Repair Shop, Parcel 66(7), Training Area T-6 (Naylor Field), Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)* (for the March/May 2004 Sampling Event)
Appendix D1 *Data Quality Summary: Training Area T-6 (Naylor Field), Parcel 183(6) and Cane Creek Training Area, Parcel 510(7), September/October 2005 Sampling Event*
Appendix E *Statistical Comparison of Site and Background Data and Geochemical Evaluation of Metals, Training Area T-6 (Naylor Field), Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)*
Appendix F Historical VOC Analytical Data for Groundwater

2.0 SITE DESCRIPTION AND PHYSICAL SETTING

2.1 Site Description and History of Parcels

The following subsections provide site background information for Training Area T-6 and Cane Creek Training Area.

2.1.1 Training Area T-6

Training Area T-6, historically known as the Howitzer Hill Decontamination Area or the Former Agent Decontamination Training Area, is a heavily wooded area located at the base of the northeastern slope of Howitzer Hill, west of Fox Road and South Branch of Cane Creek in the west-central area of McClellan (Figure 1-2). Training Area T-6 is approximately 10 acres in size and was used from an unknown date prior to 1954 until 1973 for training exercises. Within the boundary of Training Area T-6 were eight sites consisting of concrete pads on which equipment was parked for decontamination training exercises. A network of drainage ditches surrounding the training pads were used for the collection of liquid decontamination waste and may have drained to a shallow pond. During a February 1999 site visit, four of the eight concrete pads and numerous drainage ditches were located by Parsons Engineering Science, Inc. (Parsons) (Shaw, 2004). The pond area was not visible and there was no evidence of burial sites at the time of the Parsons site visit. An additional site visit conducted by Shaw in August 2000 also did not reveal any evidence of burial sites or ponds (Shaw, 2004). The area is currently fenced and posted, however, the site is accessible due to breaks in the fence.

Activities at Training Area T-6 reportedly involved the decontamination of military equipment (training aids) intentionally contaminated with various CWMs including distilled mustard (HD), lewisite (L), and sarin (GB). After being intentionally contaminated with CWM, the training aid was decontaminated using volumes of supertropical bleach (STB), decontamination agent, non-corrosive (DANC), and/or Decontamination Solution Number 2 (DS2). A majority of the decontamination training exercises occurred on the northern half of the parcel. Vehicles used as training aids at Training Area T-6 are visible on aerial photographs taken in December 1954 and March 1973. A 1982 aerial photograph, taken approximately nine years following the last reported year of decontamination training activities shows the area was largely re-vegetated (Shaw, 2004).

2.1.2 Cane Creek Training Area

Cane Creek Training Area is located adjacent to and northeast of Training Area T-6 and southeast of the intersection of Derby Street and Fox Road in the west-central area of McClellan (Figure 1-2). Cane Creek Training Area is approximately two acres in size and straddles South Branch of Cane Creek. In 1958, this area was reportedly used for training in decontamination procedures of military equipment. It is unknown if toxic agents were used in this area (Shaw, 2004).

A site visit conducted by Parsons in February 1999 identified a depression approximately 12 feet in diameter. The depression, labeled as a sump by Parsons, was located inside the boundary of

Cane Creek Training Area directly across the street from the entrance to Training Area T-6. Parsons also identified a pump located a few feet southeast of the depression. In August 2002, Shaw conducted a site visit and was able to locate the depression (sump) but did not locate the pump observed during Parsons' earlier site visit in 1999. In addition, Shaw identified another large depression in the center of the parcel with a row of concrete rubble extending from the depression toward the south. Historical aerial photographs reviewed by Parsons, indicated an abundance of activity at Cane Creek Training Area from the early 1940s until approximately 1969. A majority of the activities in the photographs appear to be related to the clearing of trails within the area especially in the north/northwestern portion of the parcel. No waste burial sites were identified during the aerial photograph review performed by Parsons. Aerial photographs reviewed by Shaw indicated the parcel was not used for training activities after 1969 (Shaw, 2004).

2.2 Geology

The geology of McClellan is discussed in the following subsections. Information contained in these subsections is based on published geologic information and data collected during the 2001 to 2003 SI/RI activities performed by Shaw and the 2004/2005 RFI conducted by MES.

2.2.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province, which is characterized by metamorphosed sedimentary rocks and the Valley and Ridge Province. McClellan lies mainly within the Valley and Ridge Province, which is part of the Appalachian fold-and-thrust structural belt. The fold and thrust belt generally features southeastward-dipping thrust faults with associated minor folding consisting of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted with major structures and faults striking in a northeast-southwest direction. Geologic contacts in this region generally strike parallel to the faults and repetition of lithologic units is common in vertical sequences. These units, from oldest to youngest, include the Cambrian-aged Chilhowee Group, Shady Dolomite, Rome Formation, Conasauga Formation, and Knox Group, and the Ordovician-aged Newala and Little Oak Limestones, as well as various siltstones, sandstones, shales, dolomites and limestones that are mapped as one, undifferentiated unit in some areas of Calhoun County.

The 39-mile long Jacksonville thrust fault is the most significant structural geologic feature in the vicinity of McClellan, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The fault is interpreted as a major splay of the Pell City fault, which serves as a fault contact between the bedrock within the McClellan window and the Rome and Conasauga Formations (Osborne and Szabo, 1984). The trace of the Pell City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt. The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the McClellan window, and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow northeast-to-southwest-trending linear zone of complex structure (approximately 90 miles in length) consisting mainly of thin imbricate thrust slices (Thomas and Drahovzal, 1974). An Ordovician-aged sequence comprising the Eden thrust sheet includes an

erosional window in the overlying thrust sheet at McClellan. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984).

2.2.2 Site-Specific Geology

Bedrock beneath Training Area T-6 and Cane Creek Training Area is mapped by Osborne et al. (1997) as undifferentiated Ordovician-age Little Oak and Newala Limestones and Mississippian/Ordovician-age Floyd and Athens Shale, undifferentiated (Figure 2-1) (Shaw, 2004). An asymmetric anticlinal fold strikes northeast-southwest across the Site and plunges to the southwest. The Mississippian/Ordovician-age Floyd and Athens Shale is mapped along the limb of the limestone anticline to the north and northwest. The extreme southwestern corner of Training Area T-6 is mapped as the Cambrian Chilhowee Group that comprises part of the Jacksonville thrust sheet. An inferred thrust fault, trending northwest to southeast, is mapped to the southeast of the parcel by Osborne and approximately parallels the fold (Osborne et al., 1997).

Site-specific geologic conditions at the Site were assessed from bedrock cores and monitoring well and soil boring lithologic logs prepared by Shaw during the SI and RI, and as part of the 2004/2005 RFI conducted by MES.

Residuum at the site consists mainly of clay and silt interspersed with small amounts of sand and gravel and varies in thickness. At the northern edge of Training Area T-6 and the northern half of Cane Creek Training Area, the thickness of the residuum is between 4 feet and 25 feet. Immediately underlying the residuum in this portion of the Site is Floyd/Athens shale (undifferentiated). Residuum above the limestone anticline in the central portion of the T-6 Training Area and the southern portion of Cane Creek Training Area varies in thickness between 12 feet and 44 feet.

The northern limb of the limestone anticline is well delineated, traversing the Site from northeast to southwest, between monitoring wells CC-510-MW02 and CWM-183-MW22. Figure 2-2 presents an estimation of the limestone anticline horizontal orientation based on geologic logs. The thickness of the limestone varies between 92 feet at CWM-183-MW31 and 132 feet at CWM-183-MW30, which are both northeast of South Branch of Cane Creek. The thickness of the limestone on the south side of South Branch of Cane Creek was 129 feet at well CWM-183-MW28, which is immediately upgradient from the collection trenches in the north-central portion of Training Area T-6.

The geologic map from Osborne et al. (1997) was revised by Shaw to reflect the data collected during the SI and RI field activities. Geologic cross sections prepared by Shaw were constructed from these data and are presented in Figures 2-3 and 2-4. The locations for the geologic cross sections A-A' and B-B' are shown on Figure 2-1. Additional geologic cross sections, C-C' and D-D', constructed by MES are presented in Figures 2-5 and 2-6.

Moderately to slightly weathered, moderately hard, unfractured to highly fractured, bedded to massive, medium to dark gray, argillaceous limestone with calcite veins and some pyrite

consistent with the undifferentiated Little Oak and Newala Limestones was encountered underlying the northeastern/eastern portion of Training Area T-6 and in the southern portion of the Cane Creek Training Area (Figure 2-1). Large voids (karst and solution cavities) within the limestone were generally encountered in the upper 40 feet of bedrock (Shaw, 2004).

Moderately weathered to unweathered, soft to moderately hard, highly to intensely fractured, gray to black shale with calcite veins typical of the Floyd Athens Shale was identified in the northern portions of Training Area T-6 and Cane Creek Training Area, and in the southern portion of Training Area T-6 (Shaw, 2004). Depths to the shale were estimated between 4 and 25 feet below ground surface in the northern portions of the Site. Shale in the southern portion of Training Area T-6 was estimated at a depth of 18 to 25 feet below ground surface.

2.3 Soil

The soil types of McClellan are discussed in the following subsections. Information contained in these subsections is based on information and data collected during the SI/RI activities performed by Shaw (Shaw, 2004) and the 2004/2005 RFI conducted by MES.

2.3.1 Regional Soil

The soil associations found at McClellan (U.S. Department of Agriculture [USDA], 1961), include:

- **Anniston-Allen, Decatur-Cumberland**. Alluvium, resulting from weathering of older residual soils developed from sandstone, shale and quartzite; deep, well-drained, level to moderately steep soil in valleys underlain by limestone and shale. Subsoil is dark red sandy clay loam. Cumberland and Decatur soils are dark reddish brown gravelly loam developed from weathered limestone.
- **Clarksville-Fullerton.** Well-drained to moderately well-drained stony or cherty soils developed in the residuum of cherty limestone. This association is limited to Pelham Range. The soils are generally dark brown to dark gray-brown silt loam.
- **Rarden-Montevallo-Lehew.** Moderately deep or shallow soils on ridgetops and steep slopes and in local alluvium in draws. Soils are developed from the residuum of shale and fine-grained, micaceous sandstone; reddish brown to dark gray-brown to yellow-brown silt loam, clay or silty clay.
- **Stony Rough Land**. Shallow, steep, and stony soils formed from the weathering of sandstone, limestone, and Talladega Slate. Infiltration is slow; the soils contain many boulders and fragments with clayey residuum. This association underlies a large portion of the Main Post at McClellan.

2.3.2 Site-Specific Soil

Two soil types are mapped at Training Area T-6 and Cane Creek Training Area. The western portion of Training Area T-6 and the eastern portion of Cane Creek Training Area are mapped as

the Anniston and Allen gravelly loams. The eastern portion of Training Area T-6 and the western portion of Cane Creek Training Area are mapped as the Montevallo shale, silt, loam, or Rarden gravelly loam. The Anniston and Allen gravelly loam develop in old alluvium on the foot slopes or colluvial fans at the base of larger hills in the region. The surface soil ranges in color from very dark grayish-brown to dark reddish-gray and dark-reddish brown. The subsoil consists of a dark reddish-gray and dark reddish-brown clay or silty clay loam. The Montevallo shaly silty loam develops in the residuum of interbedded shale and limestone. The surface soil ranges from very dark grayish-brown and very dark brown to brown. The subsoil is yellowish brown shaly silt loam. Fragments of shale are commonly found throughout the soil (USDA, 1961).

Based on data collected during the SI/RI field activities performed by Shaw (Shaw, 2004) and the 2004/2005 RFI conducted by MES, the soils underlying Training Area T-6 and the Cane Creek Training Area are a mix of alluvial, colluvial, and residual soils underlain in parts by a weathered shale residuum. The alluvial soils were generally found within the floodplain of South Branch of Cane Creek and the drainage-ways that cross Training Area T-6. The colluvial soils were generally found on the foot slopes and uplands overlying the residual soils. The residual soils were found on the uplands or beneath the alluvial soils outside the South Branch of Cane Creek floodplain. The weathered shale residuum ranges in thickness from 3 feet to greater than 23 feet and is found above the shale bedrock in the northern and western portions of Training Area T-6 and the northern portion of Cane Creek Training Area. The base of the weathered shale residuum is defined as the depth where auger refusal was encountered (Shaw, 2004).

The alluvial soils found within the floodplain of South Branch of Cane Creek range from yellowish-orange to brown in color and were comprised of cobbley, sandy, silty gravel and clay. The cobbles and gravel were generally subrounded to rounded quartz sandstone or quartzite. The alluvial soils found in the drainage ways were yellowish-orange to light brown gravelly, sandy, silty clay. The gravel found within these soils was generally subangular to subrounded quartz sandstone or quartzite. The colluvial soils were generally yellowish-orange to brown to reddish-brown gravelly clay with lesser amounts of silt and sand. The gravel within these soils was generally angular to subrounded quartz sandstone or quartzite. The residual soils were yellowish-orange to light brown in color and were comprised primarily of clay with lesser amounts of silt, sand, and gravel-size pieces of limestone and shale.

2.4 Hydrogeology

The hydrogeology and hydrology of McClellan is discussed in the following subsections. Information contained in these subsections is based on information and data collected during the SI/RI activities performed by Shaw and the 2004/2005 RFI conducted by MES.

2.4.1 Regional Hydrogeology

The hydrogeology of Calhoun County has been investigated by the Geologic Survey of Alabama (Moser and DeJarnette, 1992) and the U.S. Geological Survey (USGS) in cooperation with the Geological Survey of Alabama (Warman et al., 1960) and ADEM (Planert and Pritchette, 1989). Groundwater in the vicinity of McClellan occurs in residuum derived from bedrock

decomposition, within fractured bedrock along fault zones, and in bedrock karst frameworks. Groundwater flow direction is generally toward major surface water features. Areas with well-developed residuum horizons may subtly reflect the surface topography, but the groundwater flow direction may also indicate the influence of pre-existing structural fabrics, the presence of perched water horizons on unweathered ledges, or the presence of impermeable clay lenses.

Precipitation and subsequent infiltration provide recharge to the groundwater flow system in the region. The main recharge areas for the aquifers in Calhoun County are located in the valleys. The ridges generally consist of sandstone, quartzite, and slate which are resistant to weathering, are relatively unaffected by faulting, and are, therefore, relatively impermeable. The ridges have steep slopes and thin to no soil cover, which enhances runoff to the edges of the valleys (Planert and Pritchette 1989).

The thrust fault zones typical of the county generally form large storage reservoirs for groundwater. Points of discharge occur as springs, effluent streams, and lakes. Coldwater Spring is one of the largest springs in the State of Alabama, with a discharge of approximately 32 million gallons per day. This spring is the main source of water for the Anniston Water Department, and serves McClellan. The spring is located approximately 5 miles southwest of Anniston and discharges from the brecciated zone of the Jacksonville Fault (Warman et al., 1960).

Shallow groundwater at McClellan exists principally in the residuum developed from Cambrian sedimentary and carbonate bedrock units of the Weisner Formation, the Shady Dolomite, and locally in lower Ordovician carbonates. The residuum may yield adequate groundwater for domestic and livestock needs but may go dry during prolonged dry weather. Groundwater within the residuum serves as a recharge reservoir for the underlying bedrock aquifers. Bedrock permeability is locally enhanced by fracture zones associated with thrust faults and by the development of solution (karst) features.

Two major aquifers, the Knox-Shady aquifer and the Tuscumbia-Fort Payne aquifer, were identified by Planert and Pritchette (1989). The continuity of these aquifers has been disrupted by the complex geologic structure of the region, such that each major aquifer occurs repeatedly in different areas. The Knox-Shady aquifer group is found throughout most of Calhoun County and is the main source of groundwater in the county. It consists of the Cambrian-and-Ordovician aged quartzite and carbonates. The Conasauga Formation is the most utilized unit of the Knox-Shady aquifer, with twice as many wells drilled as any other unit (Moser and DeJarnette, 1992).

Regional groundwater flow in the bedrock for the McClellan vicinity was described by the USGS (Scott, et al., 1987). Regional groundwater elevation ranged from 800 feet above mean sea level (amsl) at McClellan to about 600 feet amsl to the west on Pelham Range, based on water depths in wells completed across multiple formations. Groundwater elevation contours suggest that regional groundwater flow is from McClellan toward the northwest. Scott et al. (1987) concluded that the groundwater surface broadly coincides with the surface topography and that the regional aquifers are hydraulically connected. Groundwater flow on a local scale may be more complex and affected by geologic structures such as the shallow thrust faults, rock fracture systems, and karst development in soluble formations.

2.4.2 Site-Specific Hydrogeology

Groundwater at the Site is influenced by several site-specific hydrogeologic factors. Three of the main hydraulic factors influencing groundwater flow at the Site include:

- South Branch of Cane Creek: The interaction between South Branch of Cane Creek and the surrounding residuum groundwater is dependent on local geology and varies at the Site along the course of the South Branch of Cane Creek. Bodies of water such as South Branch of Cane Creek can act either as a hydraulic sink that draws groundwater towards the surface water flow (gaining stream) or as a reservoir that replenishes surrounding groundwater (losing stream). At the Site, South Branch of Cane Creek acts as a gaining stream or losing stream depending on the time of year, the amount of precipitation in the area, and the local geology.
- Limestone Anticline: Drilling logs indicate that the limestone anticline identified at the Site has numerous fractures, void spaces, and solution cavities as a part of the karstic framework. Each of these voids can act as a preferential pathway for groundwater flow at the Site.
- Surface Topography: The local topography slopes towards South Branch of Cane Creek from the north and south. On the north side of South Branch of Cane Creek, the topography slopes gently towards the creek. On the south side of the creek is Howitzer Hill, the largest topographic feature in the area, where the topography slopes steeply towards South Branch of Cane Creek.

To determine site-specific hydrogeology, groundwater levels were measured in the monitoring wells at the Site as part of the 2003 RI conducted by Shaw and the 2004/2005 RFI.

2.4.2.1 2003 RI Groundwater Levels

Static groundwater levels were measured in monitoring wells at the Site on April 17, 2003 and June 23, 2003 by Shaw and are presented in Table 2-1. Groundwater elevation maps were constructed by MES for both the residuum (Figures 2-7 and 2-8) and bedrock (Figures 2-9 and 2-10) water-bearing zones using data collected by Shaw in 2003. Collection of groundwater elevation data was intended to represent an above-average period of precipitation (April) and a lower period of precipitation (June). Based on available groundwater elevations from the shallow monitoring wells, groundwater flow within the residuum generally conforms to surface topography and flows predominately to the northeast towards South Branch of Cane Creek, as shown on Figures 2-7 and 2-8. Groundwater flow in the bedrock water-bearing zone is depicted on Figures 2-9 and 2-10 and indicates a convergence of groundwater in the limestone anticline flowing towards the northeast.

Horizontal hydraulic gradients, presented in Table 2-2, were calculated by MES for the residuum and bedrock aquifers using data collected by Shaw in 2003. In the residuum, the hydraulic gradient was steeper in the southern portion of Training Area T-6 at the foot of Howitzer Hill with a gradient of 0.194 vertical feet per horizontal foot (ft/ft) in April 2003 and 0.187 ft/ft in June 2003, as calculated for wells CWM-183-MW01 to CWM-183-MW12. Closer to South

Branch of Cane Creek the hydraulic gradient was 0.006 ft/ft in April 2003 and June 2003, as calculated for wells CWM-183-MW12 to CC-510-MW04. The horizontal hydraulic gradient in the bedrock zone was 0.014 ft/ft for both April 2003 and June 2003, as calculated for wells CWM-183-MW22 to CWM-183-MW17.

Vertical hydraulic gradients between the residuum and bedrock wells were calculated by MES for seven well clusters using data collected by Shaw in 2003 and are presented in Table 2-3. The gradients were calculated from hydraulic head differences for groundwater elevations measured in April and June 2003. Vertical gradients between residuum and bedrock exhibited a downward flow in all seven well clusters and ranged from 0.001 ft/ft in well cluster CWM-183-MW15 and CWM-183-MW16 to 0.078 ft/ft in well cluster CWM-183-MW06 and CWM-183-MW11 (Shaw, 2004).

Vertical hydraulic gradients between the surface water at South Branch of Cane Creek and residuum wells near the creek were calculated by MES for two surface water/well clusters using data collected by Shaw in 2003, presented in Table 2-3. An upward vertical gradient was observed from the creek at surface water location CC-510-SW/SD03 to residuum wells CWM-183-MW18 and CC-510-MW03.

2.4.2.2 2004/2005 RFI Groundwater Levels

Groundwater levels were measured in the residuum and bedrock monitoring wells at the Site on May 25 and 26, 2004, and between September 29 and October 10, 2005. The 2004/2005 RFI groundwater levels are presented and discussed in Section 5.1 of this report.

2.4.3 Surface Hydrology

The major surface water features at McClellan include Remount Creek, Cane Creek, and Cave Creek. These waterways generally flow in a northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County. The entire central portion of McClellan is drained by three major creeks and their tributaries. South Branch of Cane Creek receives runoff from the south-central portion, and then joins Cane Creek before leaving McClellan on the western boundary. Cane Creek receives surface runoff from the central section. The north-central section of McClellan is drained by Cave Creek, which leaves the post on the northwestern boundary. Other surface water features at McClellan include Lake Yahou (13.5 acres), Reilly Lake (8.5 acres), Cappington Ridge (0.3 acres), Duck Pond (0.5 acre), and an aqueduct. Surface drainage is collected in small, independent networks that drain areas varying from 20 to 60 acres. The Cane/Cave Creek watershed is among the six major watersheds occurring within Calhoun County. Cane Creek, with its tributaries (Remount Creek, South Branch of Cane Creek, and Ingram Creek), originates within the McClellan boundary. Cave Creek, which occurs as a separate body on McClellan, originates at McClellan and discharges into Cane Creek outside McClellan. The McClellan drainage area of this system covers approximately 20 square miles. Dothard Creek headwaters originate on McClellan and flow north into the Tallasseehatchee Creek. These creek systems originate in the Choccolocco Mountains on the eastern boundary of McClellan and flow west through central McClellan. They are fed by springs originating from underlying strata (MES, 2004).

Surface runoff at the Site follows the general topography and flows into South Branch of Cane Creek, which is located just east of Training Area T-6 and flows to the north-northwest. South Branch of Cane Creek transects Cane Creek Training Area. Two drainage ditches traverse Cane Creek Training Area, one along the northern portion and one in the approximate central portion of the parcel. Several drainage ditches traverse Training Area T-6 and discharge surface water to the east-northeast, towards South Branch of Cane Creek. Additionally, surface water discharges from drainage ditches along the banks of Howitzer Hill, in the southwestern corner of Training Area T-6 (Shaw, 2004).

2.5 Wetlands

McClellan contains an estimated 3,424 acres of delineated wetlands. Major wetland communities were originally characterized and mapped in 1984 with supplementary mapping performed in 1992. Wetland habitats within McClellan are generally located in the valleys along creek floodplains, near streams, and in topographical depressions. The indicator plant species that assist in defining a wetland include water oaks, sweet gum, bulrush, needlerush, and cattail (IT Corporation [IT], 2002a). Wetland communities found on the Main Post are the Marcheta Hill Orchard Seep, Cane Creek Seep, South Branch of Cane Creek, and 200 acres west of Reilly Airfield (Endangered Species Management Plan [ESMP]) (Garland, 1996). Additionally, wetland habitat potentially exists at or around the installation's lakes, namely Lake Reilly and Lake Yahou, and along the creeks, namely Cane Creek and Cave Creek (IT, 2002a).

Training Area T-6 and Cane Creek Training Area are not located within a designated wetland area (IT, 2002a).

2.6 Sensitive Habitats

The ESMP (Garland, 1996) developed for McClellan identified 11 special interest natural areas (SINAs) within McClellan. SINAs are locations where the habitat fosters one or more rare, threatened, or endangered species. Because these species are sensitive to environmental degradation, SINAs require management practices that promote the continued well being of these ecosystems. According to the ESMP, the 11 SINAs located on McClellan include:

- Mountain Longleaf Community Complex
- Cave Creek Seep
- Moorman Hill Mountain Juniper
- Frederick Hill Aster Site
- Bains Gap Seep
- Marcheta Hill Crow-Poison Seep
- Marcheta Hill Orchid Seep
- South Branch of Cane Creek Seep
- Stanley Hill Chestnut Oak Forest
- Reynolds Hill Turkey Oak
- Davis Hill Honeysuckle.

Training Area T-6 and Cane Creek Training Area are not located within a SINA (IT, 2002a and Garland, 1996).

2.7 Threatened and Endangered Species

The following species, listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS), have been recorded on McClellan (IT, 2002a):

- Gray Bat (*Myotis grisescens*)
- Blue Shiner (*Cyprinella caerulea*)
- Mohr's Barbara Buttons (*Marshallia mohril*)
- Tennessee Yellow-Eyed Grass (*Xyris tennessensis*)

The Blue Shiner, Mohr's Barbara Buttons, and Tennessee Yellow-Eyed Grass have not been observed at the Site (Garland, 1996). The Gray Bat (*Myotis grisescens*) uses the Cane Creek Corridor as a foraging habitat, therefore, South Branch of Cane Creek was identified as a potential habitat (IT, 2002b). Because Training Area T-6 borders and Cane Creek Training Area straddles South Branch of Cane Creek, these areas may be a potential foraging habitat for the Gray Bat. An additional endangered species, the red-cockaded woodpecker, historically has inhabited McClellan, but has not been observed at McClellan in the recent past (Garland, 1996).

2.8 Meteorology

McClellan has a temperate continental, humid climate. The annual rainfall is distributed throughout the year but tends to be heavier during the winter and spring months. The average annual precipitation totals about 53 inches. Most flood-producing storms are frontal type, and occur during the winter and spring. Summer thunderstorms sometimes cause serious local floods. Snow accumulation is generally 1 inch or less. Temperature extremes are a few degrees below freezing to just over 100 degrees Fahrenheit (°F). Summer temperatures of 90°F or more occur about 70 days per year, and the average annual temperature is 63°F. Frosts are common but usually of short duration. Winds are typically light breezes with no persistent direction. Tornadoes are rare but do occur in the area. Humidity is moderate during cooler months to high during the warmer part of the year.

2.9 Floodplains

The Federal Emergency Management Agency has identified "Special Flood Hazard Areas". The Special Flood Hazard Areas are based on an area with a 1 percent annual chance of inundation by flooding for which base flood elevations or velocities may have been determined. The Cane Creek Training Area is within the floodplain of South Branch of Cane Creek (IT, 2002b).

3.0 PREVIOUS INVESTIGATIONS

This section describes previous investigations performed at the Site including:

- Environmental Baseline Study (ESE, 1998)
- Army Soil Sampling (1973 and 1992) (Shaw, 2004)
- Parsons Engineering Evaluation and Cost Analysis (EE/CA) (Parsons, 2002)
- Shaw SI and RI at Training Area T-6, and SI at Cane Creek Training Area (Shaw, 2004)

3.1 Environmental Baseline Study

The Environmental Baseline Study (EBS) was performed by ESE to document existing environmental conditions of McClellan property (ESE, 1998). The EBS identified sites that, based on available information, had no history of contamination and complied with U.S. Department of Defense (DOD) guidance on fast-track cleanup at closing installations. The EBS also provided a baseline depiction of McClellan properties by identifying and categorizing the properties using seven categories:

1) Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred.
2) Areas where only release or disposal of petroleum products has occurred.
3) Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require removal or remedial response.
4) Areas where release, disposal and/or migration of hazardous substances has occurred and all removal or remedial actions to protect human health and the environment have been taken.
5) Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken.
6) Areas where release, disposal and/or migration of hazardous substances has occurred but required actions have not been implemented.
7) Areas that are not evaluated or require additional evaluation.

The EBS was performed in accordance with protocols of the Community Environmental Response Facilitation Act (CERFA) (Public Law 102-426) and DOD policy regarding contamination assessment. Activities performed as part of the EBS included:

- Record searches and reviews on reasonably available documents from McClellan, ADEM, EPA Region IV, and Calhoun County.
- Database search of CERCLA-regulated substances, petroleum products, and RCRA-regulated facilities.
- Reviewed available historical maps and aerial photographs to document historical land uses.

- Conducted personal and telephone interviews of past and present McClellan employees and military personnel.
- Performed visual site inspections were to verify conditions of specific property parcels.

Training Area T-6 and Cane Creek Training Area were identified in the EBS as areas to be investigated prior to property transfer. Training Area T-6 was identified as a Category 6 parcel indicating that release, disposal, and/or migration of hazardous substances had occurred but required actions had not been implemented. Cane Creek Training Area was identified as a Category 7 parcel indicating that the parcel had not been evaluated and/or required additional evaluation to identify the environmental condition (ESE, 1998). Subsequent investigations of Training Area T-6 and Cane Creek Training Area were performed as described in the following subsections.

3.2 Army Soil Sampling (1973 and 1992)

Random surface soil samples collected and analyzed by the Army in March 1973 revealed no CWM. In 1992, the United States Army Technical Escort Unit collected six soil samples and field screened them for distilled mustard using a miniature continuous air monitoring system (MINICAMS) before being submitted for laboratory analysis. Neither distilled mustard nor its breakdown products were detected during the MINICAMS screening and laboratory analysis.

3.3 Parsons Engineering Evaluation and Cost Analysis

Parsons conducted an Engineering Evaluation/Cost Analysis (EE/CA) at 33 McClellan sites, including Training Area T-6 and Cane Creek Training Area, to evaluate potential CWM contamination or other subsurface disposal using geophysical surveys, excavation of suspect anomalies, continuous air monitoring, soil sampling, and laboratory analysis of soil samples for CWM and agent breakdown products (Parsons, 2002).

The geophysical surveys identified twenty-seven anomalies in the central portion of Training Area T-6, seven anomalies in the southern portion of Training Area T-6, and six anomalies in the western portion of Cane Creek Training Area (Shaw, 2004). Parsons conducted intrusive investigations at these sites in May 2001. Twenty-nine of the thirty-four anomalies detected at Training Area T-6 were determined to be metallic scrap. A majority of the metallic scrap found in the central portion of Training Area T-6 consisted of 8-gallon STB drums or associated drum parts. The anomalies identified at Cane Creek Training Area were apparently caused by metal debris. No CWM were found at either parcel (Parsons, 2002).

Surface soil (0.5 to 1 feet below ground surface [bgs]) and subsurface soil (3.5 to 4 feet bgs) were collected from sixteen soil borings (ten at Training Area T-6 and six at Cane Creek Training Area) and screened for sarin, distilled mustard, and breakdown products (1,4-thioxane and 1,4-dithiane). In addition, samples collected at Training Area T-6 were screened for lewisite, and samples collected at Cane Creek Training Area were screened for nerve agent. Soil analytical results did not indicate the presence of any residual agent or agent degradation products at either parcel. No CWM or chemical agents were found during the Parsons EE/CA

investigation.

3.4 Shaw SI and RI at Training Area T-6, and SI at Cane Creek Training Area

The SI at Training Area T-6 was conducted in 2001 by Shaw to determine whether potential site-specific chemical constituents were present at Training Area T-6 (Shaw, 2004). Based upon the results of the SI, an RI was conducted in 2002 and 2003 at Training Area T-6 to evaluate the nature and extent of contamination. An SI at Cane Creek Training Area was conducted by Shaw in 2002 and 2003, concurrently with the Training Area T-6 RI, to determine whether potential site-specific chemical constituents were present at Cane Creek Training Area (Shaw, 2004).

3.4.1 Field Activities and Analytical Program

SI field activities conducted at Training Area T-6 from October 2001 through December 2001 consisted of the following (Shaw, 2004):

- Installation of ten permanent residuum groundwater monitoring wells (sample locations CWM-183-MW01 to CWM-183-MW10) to facilitate groundwater sample collection and to provide site-specific geologic and hydrogeologic characterization information.
- Collected groundwater samples from seven of the ten monitoring wells and submitted for analysis of VOCs, semivolatile organic compounds (SVOCs), metals, and CWM breakdown products. Groundwater samples were not collected at monitoring wells CWM-183-MW05, CWM-183-MW07, and CWM-183-MW09 during the 2001 SI because the well was either dry or did not produce sufficient water.
- Collected thirteen surface soil samples and thirteen subsurface soil samples from the ten monitoring well locations and three soil boring locations (CWM-183-GP01 to CWM-183-GP03), and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected two depositional soil samples (CWM-183-DEP01 and CWM-183-DEP02) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- At completion of soil sampling, boreholes CWM-183-GP01 to CWM-183-GP03 were abandoned with bentonite chips hydrated with potable water.
- Collected one surface water sample (CWM-183-SW02) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected one sediment sample (CWM-183-SD02) at the same location as the surface water sample and submitted for analysis of VOCs, SVOCs, metals, CWM breakdown products, total organic carbon (TOC), and grain size.

RI field activities conducted at Training Area T-6 from October 2002 through March 2003 consisted of the following (Shaw, 2004):

- Installation of 14 groundwater monitoring wells (7 residuum and 7 bedrock) at sample locations CWM-183-MW11 to CWM-183-MW24) to facilitate groundwater sample collection and to provide site-specific geologic and hydrogeologic characterization information.
- Collected groundwater samples from nine existing monitoring wells (CWM-183-MW01

to CWM-183-MW04 and CWM-183-MW06 to CWM-183-MW10) and the 14 monitoring wells installed during the 2002/2003 RI, and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products. A groundwater sample was not collected at monitoring well CWM-183-MW05 during the 2002/2003 RI because the well was dry.

- Collected thirteen surface soil samples and thirteen subsurface soil samples from seven of the 2002/2003 RI monitoring well locations (CWM-183-MW12, CWM-183-MW14, CWM-183-MW15, CWM-183-MW18, CWM-183-MW21, CWM-183-MW23, and CWM-183-MW24) and six soil boring locations (CWM-183-GP04 to CWM-183-GP09), and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected seven depositional soil samples (CWM-183-DEP03 to CWM-183-DEP09) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- At completion of soil sampling, boreholes CWM-183-GP04 to CWM-183-GP09 were abandoned with bentonite chips hydrated with potable water.
- Collected one surface water sample (CWM-183-SW04) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected one sediment sample (CWM-183-SD04) at the same location as the surface water sample and submitted for analysis of VOCs, SVOCs, metals, CWM breakdown products, TOC, and grain size.

SI field activities conducted at Cane Creek Training Area from October 2002 to January 2003 included the following (Shaw, 2004):

- Installation of four residuum groundwater monitoring wells (sample locations CC-510-MW01 to CC-510-MW04) to facilitate groundwater sample collection and to provide site-specific geologic and hydrogeologic characterization information.
- Collected groundwater samples from the four monitoring wells and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected four surface soil samples and four subsurface soil samples from the monitoring well locations (CC-510-MW01 to CC-510-MW04) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected one depositional soil sample (CC-510-DEP01) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected four surface water samples (CC-510-SW01 to CC-510-SW04) and submitted for analysis of VOCs, SVOCs, metals, and CWM breakdown products.
- Collected four sediment sample (CC-510-SD01 to CC-510-SD04) at the same location as the surface water sample and submitted for analysis of VOCs, SVOCs, metals, CWM breakdown products, TOC, and grain size.

Samples collected during the SI and RI for Training Area T-6 and the SI for Cane Creek Training Area were analyzed for VOCs by EPA Method 8260B, SVOCs by EPA Method 8270C, metals by EPA Methods 6010B and 7000, CWM breakdown products (including orthosulfur compounds) by EPA Methods 8321 (modified) and 8270C (modified) (EPA, 1986). The sediment samples were also analyzed for TOC by EPA Method 9060 and grain size by American Society for Testing and Materials (ASTM) Method D422.

3.4.2 Summary of Analytical Results, Shaw SI and RI

The results of the chemical analysis of samples collected at Training Area T-6 and Cane Creek Training Area indicated that VOCs, SVOCs, metals, and one CWM product were detected in the site media. To evaluate the nature and extent of contamination, the analytical results were compared to human health site-specific screening levels (SSSLs), ecological screening values (ESVs), and background screening values for McClellan. SSSLs and ESVs were developed by Shaw as part of the human health and ecological risk evaluations associated with site investigations conducted under the BRAC Environmental Restoration Program at McClellan. The SSSLs, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values are presented in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000). The PAH background screening values were developed by Shaw at the direction of the BRAC Cleanup Team to address the occurrence of PAH compounds in surface soils at McClellan. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

3.4.2.1 Surface and Depositional Soil Samples

Thirty surface soil samples and ten depositional soil samples were analyzed during the SI and RI at Training Area T-6 and the SI at Cane Creek Training Area. The surface and depositional soil samples were collected in the uppermost foot of soil. Analytical results for the surface and depositional soil samples were compared to residential SSSLs, ESVs, and metals and PAH background screening values, as presented in Table 5-1 of the *Report of Findings, Training Area T-6 (Naylor Field), Parcel 183(6) and Cane Creek Training Area, Parcel 510(7 (Report of Findings)* (Shaw, 2004).

VOCs
Twenty VOCs were detected in the surface and depositional soil samples. The detected VOC concentrations were below SSSLs; however, the following VOCs had concentrations exceeding ESVs (Shaw, 2004):

- 1,1,2,2-Tetrachloroethane exceeded the ESV at CWM-183-GP06 and CC-510-DEP01.
- Chloroform exceeded the ESV at six sample locations (CWM-183-GP02, CWM-183-GP05, CWM-183-GP06, CWM-183-MW08, CWM-183-MW18, CC-510-DEP01).
- Styrene exceeded the ESV at CWM-183-DEP02.
- Tetrachloroethene exceeded the ESV at CWM-183-GP08.
- Trichloroethene exceeded the ESV at 14 sample locations (CWM-183-GP02, CWM-183-GP04 to CWM-183-GP09, CWM-183-MW03, CWM-183-MW04, CWM-183-MW07, CWM-183-MW08, CWM-183-MW23, CWM-183-DEP06, CC-510-DEP01).

SVOCs
Fifteen SVOCs (including eleven PAHs) were detected in three of the surface and depositional soil samples (CC-510-DEP01, CC-510-MW01, and CWM-183-GP08). Benzo(a)pyrene in CWM-183-GP08 exceeded the SSSL, but was below its background concentration. Seven

SVOCs (five PAHs [anthracene, benzo(a)pyrene, fluoranthene, phenanthrene, and pyrene] in sample CWM-183-GP08, and two non-PAHs [hexachlorobenzene and pentachlorophenol] in sample CC-510-DEP01) exceeded ESVs; however, none of the PAHs exceeded their respective background concentrations (Shaw, 2004).

Metals

Twenty-three metals were detected in the surface and depositional soil samples. Aluminum, antimony, arsenic, chromium, iron, manganese, vanadium, thallium, and zinc exceeded SSSLs in one or more samples. Aluminum, antimony, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, thallium, vanadium, and zinc exceeded ESVs in one or more samples. Aluminum, antimony, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, vanadium, and zinc exceeded background screening values in one or more samples (Shaw, 2004).

The following metals exceeded SSSLs and background screening values in surface and depositional soil samples (Shaw, 2004):

- Aluminum exceeded the SSSL and background at fourteen sample locations (CC-510-MW01, CWM-183-GP01 to CWM-183-GP03, CWM-183-MW01, CWM-183-MW02, CWM-183-MW04, CWM-183-MW06, CWM-183-MW07, CWM-183-MW09, CWM-183-MW21, CWM-183-MW23, CWM-183-MW24, and CWM-183-DEP05).
- Antimony exceeded the SSSL and background at four sample locations (CWM-183-GP05, CWM-183-GP07, CWM-183-DEP01, and CC-510-DEP01).
- Arsenic exceeded the SSSL and background at two sample locations (CWM-183-GP05 and CWM-183-DEP05).
- Chromium exceeded the SSSL and background at three sample locations (CWM-183-MW10, CWM-183-GP05, and CWM-183-GP07).
- Iron exceeded the SSSL and background at seven sample locations (CWM-183-GP01, CWM-183-GP05, CWM-183-GP07, CWM-183-MW09, CWM-183-MW23, CWM-183-DEP05, and CC-510-MW03).
- Manganese exceeded the SSSL and background at two sample locations (CC-510-MW03 and CWM-183-DEP06).
- Vanadium exceeded the SSSL and background at two sample locations (CWM-183-MW07 and CWM-183-GP05).
- Zinc exceeded the SSSL and background at sample location CC-510-DEP01.

The following metals exceeded ESVs and background screening values in one or more samples (Shaw, 2004):

- Aluminum exceeded the ESV and background at fourteen sample locations (CC-510-MW01, CWM-183-GP01 to CWM-183-GP03, CWM-183-MW01, CWM-183-MW02, CWM-183-MW04, CWM-183-MW06, CWM-183-MW07, CWM-183-MW09, CWM-183-MW21, CWM-183-MW23, CWM-183-MW24, and CWM-183-DEP05).
- Antimony exceeded the ESV and background at four sample locations (CWM-183-GP05, CWM-183-GP07, CWM-183-DEP01, and CC-510-DEP01).

- Arsenic exceeded the ESV and background at two sample locations (CWM-183-GP05 and CWM-183-DEP05).
- Barium exceeded the ESV and background at two sample locations (CWM-183-DEP03 and CC-510-MW03).
- Beryllium exceeded the ESV and background at eight sample locations (CWM-183-GP01, CWM-183-MW02, CWM-183-MW06, CWM-183-MW23, CWM-183-MW24, CWM-183-DEP01, CWM-183-DEP05, and CC-510-MW03).
- Chromium exceeded the ESV and background at three (CWM-183-MW10, CWM-183-GP05, and CWM-183-GP07).
- Cobalt exceeded the ESV and background at four sample locations (CWM-183-GP01, CWM-183-MW06, CWM-183-MW12, and CC-510-MW03).
- Copper exceeded the ESV and background at six sample locations (CWM-183-GP01, CWM-183-GP03, CWM-183-MW02, CWM-183-MW23, CWM-183-MW24, and CWM-183-DEP05).
- Iron exceeded the ESV and background at seven sample locations (CWM-183-GP01, CWM-183-GP05, CWM-183-GP07, CWM-183-MW09, CWM-183-MW23, CWM-183-DEP05, and CC-510-MW03).
- Lead exceeded the ESV and background at three sample locations (CWM-183-GP08, CWM-183-DEP05, and CWM-183-DEP06).
- Manganese exceeded the ESV and background at two sample locations (CC-510-MW03 and CWM-183-DEP06).
- Nickel exceeded the ESV and background at sample location CWM-183-MW06.
- Selenium exceeded the ESV and background at thirty-one sample locations (CWM-183-GP01 to CWM-183-GP03, CWM-183-GP05 to CWM-183-GP09, CWM-183-MW01, CWM-183-MW02, CWM-183-MW04, CWM-183-MW05, CWM-183-MW07, CWM-183-MW12, CWM-183-MW14, CWM-183-MW15, CWM-183-MW18, CWM-183-MW21, CWM-183-MW23, CWM-183-MW24, CWM-183-DEP03 to CWM-183-DEP09, and CC-510-MW01 to CC-510-MW04).
- Vanadium exceeded the ESV and background at two sample locations (CWM-183-MW07 and CWM-183-GP05).
- Zinc exceeded the ESV and background at eleven sample locations (CWM-183-GP01, CWM-183-GP05, CWM-183-GP08, CWM-183-MW06, CWM-183-MW23, CWM-183-DEP01, CWM-183-DEP03, CWM-183-DEP05, CWM-183-DEP06, CC-510-MW02, and CC-510-DEP01).

CWM Breakdown Products

CWM breakdown products were not detected in the surface soil and depositional soil samples (Shaw, 2004).

3.4.2.2 Subsurface Soils

Thirty subsurface soil samples were collected for analysis during the SI and RI at Training Area T-6 and the SI at Cane Creek Training Area. The subsurface soil samples were collected at depths greater than one foot bgs. Analytical results for the subsurface soil samples were compared to residential SSSLs and metals and PAH background screening values, as presented in Table 5-2 of the *Report of Findings* (Shaw, 2004).

VOCs
Seventeen VOCs were detected in the subsurface soil samples. Only 1,1,2,2-tetrachloroethane exceeded the SSSL in three subsurface soil samples (CWM-183-MW23, CWM-183-GP06, and CWM-183-GP08) (Shaw, 2004).

SVOCs
Only one SVOC (bis[2-ethyl]phthalate) was detected in one subsurface soil sample (CWM-183-MW23) at an estimated concentration above the SSSL (Shaw, 2004).

Metals
Twenty-two metals were detected in the subsurface soil samples. Seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium) had concentrations that exceeded SSSLs. Six of these metals also exceeded background screening values in one or more samples (Shaw, 2004):

- Aluminum exceeded the SSSL and background in twenty-five subsurface soil samples.
- Chromium exceeded the SSSL and background in subsurface soil sample CWM-183-GP07.
- Iron exceeded the SSSL and background in subsurface soil samples CWM-183-MW06, CWM-183-GP02, CWM-183-GP07, and CC-510-MW04.
- Manganese exceeded the SSSL and background in subsurface soil sample CWM-183-MW09.
- Thallium exceeded the SSSL and background in subsurface soil samples CWM-183-MW12 and CWM-183-GP07.
- Vanadium exceeded the SSSL and background in subsurface soil sample CWM-183-MW04.

CWM Breakdown Products
One CWM breakdown product (di-disopropylmethylphosphonic acid) was detected in one subsurface soil sample (CWM-183-MW23) at an estimated concentration below the SSSL (Shaw, 2004).

3.4.2.3 Groundwater

A total of 34 groundwater samples were collected from 28 monitoring wells during the SI and RI. Analytical results for the groundwater samples were compared to residential SSSLs and metals and PAH background screening values, as presented in Table 5-3 of the *Report of Findings* (Shaw, 2004).

VOCs
Twenty-three VOCs were detected in the groundwater samples. The concentrations for thirteen VOCs exceeded their respective SSSLs: 1,1,1,2-Tetrachloroethane (one well), 1,1,2,2-tetrachloroethane (17 wells), 1,1,2-trichloroethane (8 wells), 1,1-dichloroethene (8 wells), 1,2-dichloroethane (2 wells), acetone (2 wells), bromodichloromethane (2 wells), chloroform (13 wells), cis-1,2-dichloroethene (4 wells), trans-1,2-dichloroethene (4 wells), tetrachloroethene

(one well), trichloroethene (18 wells), and vinyl chloride (5 wells) (Shaw, 2004).

The highest concentrations of six VOCs (1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene) were in residuum monitoring well CWM-183-MW07. The highest VOC contamination (primarily chlorinated VOCs) in groundwater was located in the northern section of Training Area T-6 at or directly downgradient of the concrete pads used for decontamination training exercises.

SVOCs
Only one SVOC (bis[2-ethyl]phthalate) was detected in one groundwater sample (CWM-183-MW02) at an estimated concentration above the SSSL (Shaw, 2004).

Metals
Nineteen metals were detected in the groundwater samples. Six metals (aluminum, barium, iron, manganese, thallium, and vanadium) had concentrations that exceeded SSSLs and background screening values. Chromium and nickel also exceeded SSSLs; however, background screening values were not available for these two metals (Shaw, 2004).

- Aluminum exceeded the SSSL and background in two wells (CWM-183-MW04 [SI] and CWM-183-MW12 [RI]).
- Barium exceeded the SSSL and background in four wells (CWM-183-MW02, CWM-183-MW06, and CWM-183-MW07 [SI and RI]; CWM-183-MW04 [SI]).
- Chromium exceeded the SSSL (no background available) in six wells (CWM-183-MW03, CWM-183-MW04, CWM-183-MW07, CWM-183-MW09, and CWM-183-MW12 [RI]; CC-510-MW01).
- Iron exceeded the SSSL and background in groundwater sample CWM-183-MW12.
- Manganese exceeded the SSSL and background in eight groundwater samples (CWM-183-MW03, CWM-183-MW04, CWM-183-MW10 [SI and RI]; CWM-183-MW07, CWM-183-MW18, and CWM-183-MW24 [RI]; CC-510-MW01, CC-510-MW03.
- Nickel exceeded the SSSL (no background available) in two wells (CWM-183-MW04 [SI]; CWM-183-MW06 [SI and RI]).
- Thallium exceeded the SSSL and background in four wells; however, three of the thallium results were attributed to laboratory contamination. The thallium concentration exceeding the SSSL and background and not attributed to laboratory contamination was from well CC-510-MW04.
- Vanadium exceeded the SSSL and background in one well, however, the vanadium result was attributed to laboratory contamination.

CWM Breakdown Products
CWM breakdown products were not detected in the groundwater samples (Shaw, 2004).

3.4.2.4 Surface Water

Six surface water samples were collected for analysis at Training Area T-6 and Cane Creek Training Area. Analytical results for the surface water samples were compared to SSSLs, ESVs, and metals and PAH background screening values, as presented in Table 5-4 of the *Report of*

Findings (Shaw, 2004).

VOCs
Eleven VOCs were detected in the surface water samples. 1,1,2,2-Tetrachloroethane exceeded the SSSL in surface water at sample location CC-510-SW04. Vinyl chloride exceeded the SSSL and ESV in surface water sample CC-510-SW03, and the SSSL in surface water sample CC-510-SW04 (Shaw, 2004).

SVOCs
SVOCs were not detected in the surface water samples (Shaw, 2004).

Metals
Twelve metals were detected in the surface water samples. Arsenic, iron, and manganese exceeded the SSSL and background in surface water sample CC-510-SW03. Barium, iron, and manganese exceeded the ESV and background in surface water sample CC-510-SW03. Barium also exceeded the ESV and background in surface water sample CWM-183-SW02 (Shaw, 2004).

CWM Breakdown Products
CWM breakdown products were not detected in the surface water samples (Shaw, 2004).

3.4.2.5 Sediments

Six sediment samples were collected for analysis at Training Area T-6 and Cane Creek Training Area. Analytical results for the sediment samples were compared to SSSLs, ESVs, and metals background screening values, as presented in Table 5-5 of the *Report of Findings* (Shaw, 2004).

VOCs
Eleven VOCs were detected in the sediment samples. No VOCs exceeded their respective SSSLs. Vinyl chloride exceeded the ESV in sediment sample CC-510-SD03 (Shaw, 2004).

SVOCs
Two SVOCs, benzo(b)fluoranthene and bis(2-ethyl)phthalate, were detected in one sediment sample (CC-510-SD03) at estimated concentrations below the SSSL. However, the bis(2-ethyl)phthalate concentration in sample CC-510-SD03 exceeded the ESV (Shaw, 2004).

Metals
Twenty metals were detected in the sediment samples. The metals results were below their respective SSSLs. Arsenic, copper, and mercury had concentrations that exceeded ESVs and background screening values in sample CWM-183-SD02 (Shaw, 2004).

CWM Breakdown Products
CWM breakdown products were not detected in the surface water samples .

Total Organic Carbon
TOC was detected in the sediment samples ranging in concentration from 32.9 to 36,900 mg/kg.

3.4.3 Constituents of Potential Concern and Potential Ecological Concern

Constituents detected at concentrations exceeding SSSLs and background levels were identified by Shaw (Shaw, 2004) to be constituents of potential concern (COPCs) in site media. Based on the analytical results of the SI and RI at Training Area T-6 and the SI at Cane Creek Training Area, the following constituents were identified as COPCs at the Site:

- Nine metals (aluminum, antimony, arsenic, chromium, iron, manganese, thallium, vanadium, and zinc) and one VOC (1,1,2,2-tetrachloroethene) were selected as COPCs in soil.
- Eight metals (aluminum, barium, chromium, iron, manganese, nickel, thallium, and vanadium) and 13 VOCs, primarily chlorinated solvents chloroform, cis-1,2-dichloroethene, 1,1,2,2-tetrachloroethene, trichloroethene, and tetrachloroethene, were selected as COPCs in groundwater.
- Three metals (arsenic, iron, and manganese) and two VOCs (1,1,2,2-tetrachloroethene and vinyl chloride) were selected as COPCs in surface water.
- No COPCs were identified for sediment.

Constituents detected at concentrations exceeding ESVs and background levels were identified by Shaw (Shaw, 2004) to be constituents of potential ecological concern (COPECs) in site media. Based on the analytical results of the SI and RI at Training Area T-6 and the SI at Cane Creek Training Area, the following constituents were identified as COPECs at the Site:

- Fifteen metals (aluminum, antimony, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc), five VOCs (1,1,2,2-tetrachloroethene, chloroform, styrene, tetrachloroethene, and trichloroethene), and two SVOCs (hexachlorobenzene and pentachlorophenol) were selected as COPECs in surface soil.
- Three metals (barium, iron, and manganese) and one VOC (vinyl chloride) were selected as COPECs in surface water.
- Three metals (arsenic, copper, and mercury) and one VOC (vinyl chloride) were selected as COPECs in sediment.

4.0 2004/2005 RCRA FACILITY INVESTIGATION

This section describes the activities performed for the 2004/2005 RFI. Objectives of the 2004/2005 RFI were to (1) further define vertical and horizontal extent of groundwater contamination, (2) obtain additional information regarding area hydrogeology, (3) confirm the presence of VOCs in sediment and surface water, and (4) confirm the presence of metals in surface soil. To help meet the objectives of the 2004/2005 RFI the following activities were conducted:

- Installed seven monitoring wells (three in 2004 and four in 2005): five in bedrock and two in the residuum zone.
- Evaluated groundwater hydrogeology by performing slug tests in the groundwater monitoring wells installed in 2004.
- Collected 42 groundwater samples during two rounds of sampling from twenty-one existing monitoring wells and the seven new monitoring wells (18 samples in 2004 and 24 samples in 2005) and analyzed for VOCs.
- Collected one groundwater sample from an existing monitoring well during the 2005 sampling round and analyzed for metals.
- Collected six surface water samples and six co-located sediment samples (three in 2004 and three in 2005) from the South Branch of Cane Creek and analyzed for VOCs.
- Collected five surface soil samples and one depositional soil sample and analyzed for metals.

Table 4-1 presents the sample designations for the 2004/2005 RFI. Figure 4-1 shows the sample locations for the 2004/2005 RFI.

4.1 Monitoring Well Installation

Seven monitoring wells were installed within and near the Site to further evaluate groundwater quality and hydrogeology. Figure 4-1 shows the locations of the 2004/2005 RFI monitoring wells.

Bhate Environmental Associates, Inc. (Bhate) and Boart Longyear installed two residuum wells and one bedrock well in March 2004. The wells were drilled using a Gus Pech GP24-300RS drilling rig utilizing rotosonic capabilities. HGS Engineering, Inc. (HGS) installed four bedrock wells in August and September 2005. Drilling methods were consistent with methods presented in the *Installation-Wide Sampling and Analysis Plan (SAP)* (MES, 2004). Well installation followed procedures presented in *Appendix C of the SAP* (MES, 2004).

During drilling, field screening was performed using a YSI photo ionization detector (PID). An SDI Quick Check field-testing kit for chlorinated volatiles in water was used to estimate the depth of VOC contamination in groundwater during the drilling of wells CMW-183-MW28, CMW-183-MW29, CMW-183-MW30, and CMW-183-MW31 in 2005. Lithologic sampling was performed concurrently when advancing borings for monitoring well construction.

Monitoring wells were constructed using 4-inch PVC casing with a 0.010-slot screen within the

drill augers to keep the borehole from collapsing. After placement of the well, the augers were pulled back as the 20/40 gradational sand pack was tremied to a minimum of 2 feet above the screen into the borehole annular space. Once the filter pack was set, a wetted 2- to 5-foot thick bentonite pellet seal was tremied into place and a Type 1 Portland cement/bentonite grout was pumped into the open annular space to a depth of approximately 2-feet bgs. Following installation, the wells were surveyed for both horizontal and vertical control by SAIN Associates, Inc, an Alabama licensed surveyor.

Table 4-2 presents well coordinates and elevations, and summarizes the construction details for the monitoring wells at the Site, including the wells installed by Shaw in 2001 and 2003 and the wells installed during the 2004/2005 RFI. The monitoring well installation documentation forms for the wells installed in 2004 and 2005 are provided in Appendix A, and include boring logs (Appendix A1), well construction diagrams (Appendix A2), and well development forms (Appendix A3).

4.2 Slug Testing

Falling head and rising head slug tests were performed in April 2004 on the three newly installed monitoring wells to estimate hydraulic conductivity in the vicinity of the wells in accordance with the *SAP* (MES, 2004). The slug tests were performed by inserting a solid slug into each well below the static water level to displace a known volumetric quantity of groundwater. Groundwater levels were recorded using a pressure transducer and the groundwater was allowed to reach equilibrium. Once static water level conditions were re-established, the slug was removed, and the resulting groundwater recharge for each well was recorded using the pressure transducer. The slug test data collected at each well was analyzed using the Bouwer and Rice Method (1976) for unconfined aquifers, and an average hydraulic conductivity for each well was calculated. Results are discussed in Section 5.1.1 of this report. Slug test data is presented in Appendix A4.

4.3 Groundwater Sampling

Groundwater samples were collected during two rounds of sampling conducted in May 2004 and September/October 2005 to further define VOC vertical and horizontal extent of groundwater contamination. In 2004 groundwater samples were collected from 18 monitoring wells (13 residuum and five bedrock), including the three monitoring wells installed in March 2004. In 2005 groundwater samples were collected from 24 monitoring wells (15 residuum and 9 bedrock), including the four bedrock monitoring wells installed in August/September 2005. The groundwater samples were collected in accordance with methodology presented in the *SAP* (MES, 2004).

Before groundwater samples were collected, water levels were measured to the nearest hundredth of a foot using a Solinst™ water level indicator and total well depth was measured and recorded. The groundwater samples were collected using low-flow sampling (LFS) procedures, which minimize the hydraulic stress on the aquifer during purging and sampling. In general, LFS is performed by using an adjustable rate pump to remove water from the screened interval of a monitoring well at a rate that will cause minimal draw down of the groundwater in

the well. A submersible bladder pump was lowered into the well and positioned at the screened interval. Poly tubing leading from the discharge side of the submersible pump was connected to a flow-through cell equipped with a YSI Model Multiprobe Water Quality Meter (or equivalent) to measure chemical and physical parameters within the groundwater. Measurements of chemical and physical parameters were used to indicate when groundwater quality had stabilized and sampling could begin. Chemical and physical parameters included pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, and temperature. Pumping rate, water level and volume of groundwater removed were also recorded. Typically, pumping rates were 100 milliliters (ml) per minute or less. The monitoring well sample collection logs are provided in Appendix B1.

Groundwater samples were collected from each well after chemical and physical parameters had stabilized. Laboratory-supplied sample bottles were filled, labeled, placed in a chilled cooler, and shipped under chain-of-custody procedures to EMAX Laboratories in Torrance, California (EMAX). The groundwater samples collected during the 2004/2005 RFI were analyzed for VOCs by Method SW8260B Gas Chromatography/Mass Spectrometry (GC/MS). One groundwater sample (CC-510-MW01) collected during the 2005 sampling event was also analyzed for metals by Methods SW6010B and SW7470A to further define the horizontal extent of metals in groundwater. Figure 4-1 shows the groundwater sampling locations. Table 4-1 presents the groundwater sample designations and analytical parameters. The chain-of-custody forms for the groundwater samples collected for the 2004/2005 RFI are provided in Appendix B2.

4.4 Surface Water Sampling

Six surface water samples (three in 2004 and three in 2005) were collected along the South Branch of Cane Creek at locations upstream and downstream of Cane Creek Training Area, and within Cane Creek Training Area. Surface water sampling was performed following the methodology presented in the *SAP* (MES, 2004). Surface water samples were collected, using a stainless-steel pitcher or other appropriate device, midstream at mid-depth. The surface water samples were collected before the sediment samples (Section 4.4) to avoid undue disturbance of the sediment and possible contaminant release into the surrounding surface water. Laboratory-supplied sample bottles were filled, labeled, placed in a chilled cooler, and shipped under chain-of-custody procedures to EMAX. The surface water samples collected during the 2004/2005 RFI were analyzed for VOCs by Method SW8260B GC/MS. Figure 4-1 shows the surface water sampling locations. Table 4-1 presents the surface water sample designations and analytical parameters. The chain-of-custody forms for the surface water samples collected for the 2004 RFI/2005 are provided in Appendix B2.

4.5 Sediment Sampling

Six sediment samples (three in 2004 and three in 2005) were collected from the South Branch of Cane Creek at the same locations as the surface water samples. Sediment sampling was performed following the methodology presented in the *SAP* (MES, 2004). Sediment samples were collected using a decontaminated stainless-steel spoon or other appropriate device. Laboratory-supplied sample bottles were filled, labeled, placed in a chilled cooler, and shipped

under chain-of-custody procedures to EMAX. The sediment samples collected during the 2004/2005 RFI were analyzed for VOCs by Method SW8260B GC/MS. Figure 4-1 shows the sediment sampling locations. Table 4-1 presents the sediment sample designations and analytical parameters. The chain-of-custody forms for the sediment samples collected for the 2004/2005 RFI are provided in Appendix B2.

4.6 Surface and Depositional Soil Sampling

Four surface soil samples were collected at locations within and near the southern portion of Training Area T-6 and one surface soil sample was collected in the central portion of Cane Creek Training Area. One depositional soil sample was collected upstream of Cane Creek Training Area near the South Branch of Cane Creek. Soil sampling was performed following the methodology presented in the *SAP* (MES, 2004). Surface soil samples were collected at depths between 0 and 1 foot using a split-spoon sampler, hand auger, spoon, trowel, or scoop. Soil sampling equipment that came into contact with samples or sampling surfaces was constructed of stainless-steel, borosilicate glass, or Teflon®. The surface soil and depositional soil samples collected in September 2005 were analyzed for metals by Method SW6010B. Figure 4-1 shows the surface soil and depositional soil sample locations. Table 4-1 presents the sediment sample designations and analytical parameters. The chain of custody forms for the surface soil and depositional soil samples collected for the 2004/2005 RFI are provided in Appendix B2.

4.7 Management of Investigation Derived Waste

Investigative derived waste (IDW) was managed and disposed as described in the *SAP* (MES, 2004). The liquid IDW generated during the groundwater sampling was collected in 55-gallon drums at the Site. The drums were stored at 1160B Town Center Drive, Building 1698. IDW fluids were transferred to a 5,000 gallon polyethylene tank and sampled for VOCs, polychlorinated biphenyls (PCBs), and metals. Following approval of the City of Anniston Water Department, the IDW fluids were discharged to the sanitary sewer.

The solid IDW was transferred to 20 cubic yard roll-off storage bins and sampled for VOCs, PCBs, and lead. Following approval from ADEM, the solid IDW was transferred to the Sand Valley Landfill (Subtitle D landfill) located in Collinsville, Alabama, by Allied Waste Industries, Inc.

4.8 Data Quality Review

MES reviewed the analytical data for the groundwater, surface water, sediment, and surface soil samples collected in May 2004 and September/October 2005. The data quality review was performed in accordance with the *Quality Assurance Plan (QAP)* (MES, 2005) to assess compliance with the quality assurance (QA) objectives, and to assess hard copy and electronic deliverable consistency and integrity.

4.9 Statistical Evaluation of Metals Results

To evaluate the nature and extent of metals contamination at the Site, a statistical evaluation was

performed to identify metals that may be present at elevated concentrations as a result of site related activities. The statistical evaluation consisted of a multi-tiered approach described as follows:

- **Tier 1:** The maximum detected concentration (MDC) of each metal was compared to the background screening criterion (i.e., two times the mean of the background data) (SAIC 1998). Metals with MDCs that did not exceed the background screening criterion were considered to be present at background concentrations, and therefore, were not selected as site-related constituents; these metals were not considered further in the evaluation. Metals with MDCs that exceeded the background screening criterion were then evaluated under Tier 2.

- **Tier 2:** The Tier 2 evaluation included the: (a) the Wilcoxon Rank Sum (WRS) test, (b) box plots, and (c) the hot measurement test. Metals that failed either of these tests were then evaluated under Tier 3.

- **Tier 3:** Tier 3 consisted of a geochemical evaluation to determine whether concentrations of site metals were naturally occurring or elevated due to contamination. This evaluation is based on the natural association between a trace element and one or more specific soil-forming minerals that concentrate that trace element. Trace elements that appeared anomalously high relative to the major associated elements were considered to be present due to site related activities.

Metal results that failed all three tiers were considered to be contaminants at the Site. To evaluate which metals are COPCs at the Site, metal contaminants are compared to SSSLs and ESVs. The results of the statistical evaluation of metals are discussed in Section 5.5.

5.0 RESULTS OF 2004/2005 RFI AND NATURE AND EXTENT

This section discusses the results of the 2004/2005 RFI at the Site and presents the nature and extent of contamination based on the VOC results for groundwater, surface water, and sediment samples, and metal results for groundwater and surface soil samples collected during the 2004/2005 RFI. To provide a more complete understanding of the nature and extent of contaminants at the Site, historical data for VOCs, SVOCs, metals, and CWM breakdown products for groundwater, surface water, sediment, surface soil, and subsurface soil samples collected during previous investigations performed by Shaw (Shaw, 2004) for the Site were incorporated into this assessment. When assessing the nature and extent of contamination in groundwater at the Site, only the most recent data for each monitoring well was used. As discussed in Section 2.1 of this RFI and in the *Report of Findings* (Shaw, 2004) the primary sources of contamination at the Site are likely from releases during training activities performed at concrete pads and trenches in the northern half of Training Area T-6.

5.1 2004/2005 RFI Groundwater Levels

Groundwater levels were measured by MES in 31 monitoring wells on May 25 and 26, 2004 and in 24 monitoring wells between September 29 and October 10, 2005, presented in Table 5-1. Groundwater elevation maps with estimated potentiometric contours were constructed for the residuum wells (presented in Figures 5-1 [May 2004] and 5-2 [September/October 2005]) and for the bedrock wells (presented in Figures 5-3 [May 2004] and 5-4 [September/October 2005]). Because of the interaction between South Branch of Cane Creek and the surrounding residuum groundwater at the Site, surface water levels measured on April 21, 2004 and September 28, 2005, presented in Table 5-1, were incorporated in the groundwater elevation maps constructed for the residuum wells, Figures 5-1 and 5-2, respectively.

At the Site, groundwater flow within the residuum generally conforms to surface topography and flows predominately to the northeast towards South Branch of Cane Creek, as indicated in Figures 5-1 and 5-2. In May 2004, typically a period of high precipitation, the South Branch of Cane Creek acts as a losing stream in the southern portion of the Site (approximately within the limestone strike), and as a gaining stream in the northern portion of the Site (approximately within the local shale bedrock). In September/October 2005, the Creek again acts as a gaining stream in the northern portion of the Site and a losing stream in the southern portion of the Site, however the point at which the creek changes from losing to gaining is further to the south in 2005.

Groundwater flow in the bedrock water-bearing zone in May 2004 (Figure 5-3) and September/October 2005 (Figure 5-4) tends to demonstrate convergent flow along the estimated limestone strike towards the northeast, where it gradually turns to the north near South Branch of Cane Creek.

5.1.1 2004/2005 RFI Horizontal Hydraulic Gradients

Horizontal hydraulic gradients were calculated separately for the residuum and bedrock water-bearing zones at the Site using the groundwater data collected in 2004 and 2005, presented

in Table 5-2.

5.1.1.1 May 2004 Horizontal Hydraulic Gradients

In May 2004, the horizontal gradients for the residuum water-bearing zone ranged from a high of 0.165 ft/ft to a low of 0.005 ft/ft. The higher horizontal gradients occurred along the slope of Howitzer Hill in the southern portion of Training Area T-6 and decreased near South Branch of Cane Creek. The site-wide horizontal gradient between residuum wells CWM-183-MW01 and CC-510-MW02 was 0.054 ft/ft. Horizontal hydraulic gradients for bedrock water-bearing zones were not calculated using the 2004 data, due to the lack of a suitable downgradient well.

5.1.1.2 September/October 2005 Horizontal Hydraulic Gradients

In September/October 2005, the horizontal gradients for the residuum water-bearing zone ranged from a high of 0.092 ft/ft near the base of Howitzer Hill to a low of 0.005 ft/ft near South Branch of Cane Creek. The horizontal gradients for the bedrock zone ranged from a high of 0.057 ft/ft northeast of South Branch of Cane Creek to a low of 0.009 ft/ft near the trenches in the northwest portion of Training Area T-6.

5.1.2 2004/2005 RFI Vertical Hydraulic Gradients

Vertical hydraulic gradients between the residuum and bedrock groundwater zones were calculated for eight well pairs from May 2004 groundwater data and five well pairs from September/October 2005 groundwater data, presented in Table 5-3. Vertical hydraulic gradients between the surface water and residuum groundwater zone were calculated for one surface water/well pair from 2004 data and three surface water/well pairs from 2005 data, presented in Table 5-3. The vertical gradients were calculated based on the conclusion that surface water from South Branch of Cane Creek and groundwater in the residuum and bedrock zones are hydraulically connected.

5.1.2.1 May 2004 Vertical Hydraulic Gradients

In May 2004, vertical gradients between residuum and bedrock exhibited a downward flow in seven of the eight well pairs, and an upward flow in one well pair. The highest downward vertical gradient between the residuum and bedrock water-bearing zones, 0.062 ft/ft, was between wells CWM-183-MW03 and CWM-183-MW17, and the lowest downward vertical gradient, 0.0003 ft/ft, was between wells CWM-183-MW15 and CWM-183-MW16. Well pair CC-510-MW04 and CWM-183-MW27, located within 100 feet of South Branch of Cane Creek, had an upward vertical flow gradient of 0.003 ft/ft.

In 2004, vertical hydraulic gradients between surface water and the residuum exhibited an upward gradient of 1.131 ft/ft between surface water sample CC-510-SW/SD07 and residuum well CC-510-MW01 and a downward gradient of 0.510 ft/ft between surface water sample CC-510-SW/SD06 and residuum well CC-510-MW04, supporting evidence that South Branch of Cane Creek is a gaining stream in the northern portion of the study area and a losing stream in the southern portion of the study area. In each of the vertical gradient calculations, the data

points used were horizontally offset between 100 feet and 125 feet, causing the horizontal groundwater flow gradients to influence the magnitudes of the vertical gradients.

5.1.2.2 September/October 2005 Vertical Hydraulic Gradients

In September/October 2005, vertical hydraulic gradients between residuum and bedrock exhibited a downward flow in four of the five well pairs, and an upward flow in one well pair. The highest downward vertical gradient between the residuum and bedrock water-bearing zones, 0.078 ft/ft, was between wells CWM-183-MW04 and CWM-183-MW13, and the lowest downward vertical gradient, 0.006 ft/ft, was between wells CWM-183-MW21 and CWM-183-MW22. Well pair CC-510-MW04 and CWM-183-MW27, located within 100 feet of South Branch of Cane Creek, had an upward vertical flow gradient of 0.006 ft/ft.

In 2005, vertical hydraulic gradients between surface water and the residuum exhibited an upward gradient of 0.674 ft/ft between surface water sample CC-510-SW/SD08 and residuum well CC-510-MW01 and a downward gradient of 0.183 ft/ft between surface water sample 510-SW/SD10 and residuum well CWM-183-MW26. At surface water/residuum well pair CC-510-SW/SD09 and CC-510-MW03, a downward vertical gradient of 0.226 ft/ft was calculated. Along with the potentiometric contours interpreted from the 2005 groundwater/surface water sampling event, these gradients support evidence that South Branch of Cane Creek is a gaining stream in the northern portion of the study area and a losing stream in the southern portion of the study area. In each of the vertical gradient calculations, however, the data points used were horizontally offset between 50 feet and 150 feet, causing the horizontal groundwater flow gradients to influence the magnitudes of the vertical gradients.

5.2 Slug Testing

Between April 22 and April 29, 2004, Bhate performed a series of falling head and rising head slug tests at monitoring wells CWM-183-MW25, CWM-183-MW26, and CWM-183-MW27. Hydraulic conductivities were estimated for these monitoring wells by displacing a known volume of groundwater in each well and recording the resulting equilibration and recharge. A homogonous lithology with an anisotropy ratio of 1:1 (assuming vertical hydraulic conductivity is equal to horizontal hydraulic conductivity) was assumed for method analysis. However, bedrock fractured rock aquifers, such as the limestone anticline present at the Site, have some degree of anisotropy and the hydraulic conductivity in the direction of the fractures is expected to be significantly higher.

Before the initiation of the slug test, a static water level was recorded at each well. Once static conditions were established, a 2.5-inch diameter by 60-inch long solid slug was lowered into the water and the resulting equilibration head pressure data, expressed in pounds per square inch (psi), were recorded by an In Situ, Inc. miniTroll® at timed intervals as part of the falling head test. After water levels reached close to 99% of the initial static water level, the slug was quickly removed. The resulting recharge was recorded by the miniTroll® transducer, and the rising head slug test was ended once the recharge was complete. The resulting head pressure data for the falling head and rising head intervals were converted to feet and graphed versus time. The Bouwer and Rice Method analysis for unconfined aquifers was performed using AquiferWin32

software, Version 2.0. The results for each well are discussed in the following subsections and a summary of hydraulic conductivity is included in Table 5-4. Slug test graphs are presented in Appendix A4.

5.2.1 Monitoring Well CWM-183-MW25 Slug Test

On April 23, 26, and 29, 2004, three falling head and three rising head slug tests were performed at monitoring well CWM-183-MW25. The resulting hydraulic conductivities were estimated at 23.3 ft/day for the falling head test and 40.1 ft/day for the rising head slug test. Two more falling head and rising head slug tests were performed in a similar manner, and the resulting hydraulic conductivities were 48.0 ft/day and 39.6 ft/day for the falling head slug tests and 60.7 ft/day and 34.1 ft/day for the rising head slug tests. The average hydraulic conductivity at CWM-183-MW25 estimated from the falling head and rising head slug tests (excluding the highest and lowest values) was 40.5 ft/day. CWM-183-MW25 is screened within the first 15 feet of the weathered shale bedrock immediately north of the limestone anticline within the Training Area T-6 boundary. The relatively low hydraulic conductivities recorded during the slug tests are indicative of the shale at Training Area T-6.

5.2.2 Monitoring Well CWM-183-MW26 Slug Test

On April 22, 2004, three falling head and three rising head slug tests were performed at monitoring well CWM-183-MW26. The resulting hydraulic conductivities were estimated at 846 ft/day for the falling head test and 2,755 ft/day for the rising head slug test. Two more falling head and rising head slug tests were performed in a similar manner, and the resulting hydraulic conductivities were 432 ft/day and 285 ft/day for the falling head slug tests and 431 ft/day and 763 ft/day for the rising head slug tests. The average hydraulic conductivity at CWM-183-MW26 estimated from the falling head and rising head slug tests (excluding the highest and lowest values) was 618 ft/day. CWM-183-MW26, located approximately 80 feet west of South Branch of Cane Creek is screened partially in the residuum and partially in the limestone anticline observed at the Site. The hydraulic conductivities at this well are higher by an order of magnitude than the hydraulic conductivities recorded at well CWM-183-MW25, which supports the observed preferential flow of groundwater in the limestone at Training Area T-6. The higher conductivities may be due to the portion of the well screened in the unconsolidated residuum and/or the highly fractured limestone observed at Training Area T-6.

5.2.3 Monitoring Well CWM-183-MW27 Slug Test

On April 23, 2004, three falling head and three rising head slug tests were performed at bedrock monitoring well CWM-183-MW27. The resulting hydraulic conductivities were estimated at 2,190 ft/day for the falling head test and 5,702 ft/day for the rising head slug test. Two more falling head and rising head slug tests were performed in a similar manner, and the resulting hydraulic conductivities were 2,302 ft/day and 2,711 ft/day for the falling head slug tests and 5,767 ft/day and 13,326 ft/day for the rising head slug tests. The average hydraulic conductivity at CWM-183-MW27 estimated from the falling head and rising head slug tests (excluding the highest and lowest values) was 4,121 ft/day. CWM-183-MW27 is screened in the fractured limestone anticline near the western boundary of Cane Creek Training Area approximately 80

feet from South Branch of Cane Creek. The variable hydraulic conductivities may be due to the Bouwer and Rice Method analysis which does not take into consideration the possible presence of semi-confined aquifer conditions within the limestone bedrock. In addition, fractures and solution cavities within the bedrock may be responsible for the high hydraulic conductivities observed at CWM-183-MW27, supporting the observed preferential flow of groundwater in the limestone at Training Area T-6.

5.3 2004/2005 RFI Analytical Data and Data Quality Review

The analytical data for the 2004/2005 RFI samples are provided in Appendix C. MES reviewed the analytical data in accordance with the quality assurance plan *QAP* (MES, 2005). The results of the data quality review for the groundwater, surface water, and sediment samples collected in 2004 are presented in the *Data Quality Summary* (*DQS*) in Appendix D. The results of the data quality review for the groundwater, surface water, sediment, and soil samples collected in 2005 are presented in the *DQS* in Appendix D1. Because the sampling and laboratory analysis for the 2004 samples occurred simultaneously with the Small Weapons Repair Shop, Parcel 66(7), the *DQS* in Appendix D (dated October 2004) includes the data review for samples collected from Parcel 66(7) as well as Parcels 183(6) and 510(7).

Based on the data quality review, the analytical data generated for this investigation were adequate to fulfill program objectives and may be used to define the nature and extent of contamination and support the selection and implementation of any appropriate corrective measure.

5.4 2004/2005 RFI Groundwater Field Parameter Results

Field measurements of chemical and physical parameters collected at each of the sampled wells were used to indicate when groundwater quality had stabilized and sampling could begin. Chemical and physical parameters included pH, conductivity, DO, ORP, turbidity, and temperature. In addition to indicating the stabilization of groundwater for sampling, these parameters can assist in identifying the condition of the well, aquifer type, groundwater quality, and contaminant degradation. The chemical and physical parameters for the 2004/2005 RFI groundwater samples are summarized in Table 5-5.

5.5 Summary of 2004/2005 RFI Analytical Results

This section describes the analytical results for the samples collected during the 2004/2005 RFI.

5.5.1 2004/2005 RFI Groundwater Analytical Results

During the 2004/2005 RFI a total of 42 groundwater samples were collected from 13 residuum and 5 bedrock monitoring wells in 2004, and 15 residuum and 9 bedrock monitoring wells in 2005, and analyzed for VOCs (Table 4-1). The groundwater sample collected from well CC-510-MW01 was also analyzed for total metals. The analytical results for VOCs and metals detected in the 2004/2005 RFI groundwater samples are presented in Table 5-6.

Thirteen VOCs were detected in the groundwater samples collected in 2004, including:

- 1,1,1,2-Tetrachloroethane (1,1,1,2-PCA) was detected in one of the 18 groundwater samples collected in 2004, with an estimated concentration of 0.36 J µg/L.
- 1,1,2,2-Tetrachloroethane (1,1,2,2-PCA) was detected in five of the 18 groundwater samples collected in 2004, with concentrations ranging from 1.4 µg/L to 390 µg/L.
- 1,1,2-Trichloroethane (1,1,2-TCA) was detected in three of the 18 groundwater samples collected in 2004, with concentrations ranging from 0.23 J µg/L to 1.4 µg/L.
- 1,1-Dichloroethene (1,1-DCE) was detected in two of the 18 groundwater samples collected in 2004, with concentrations ranging from 0.29 J µg/L to 0.41 J µg/L.
- 1,2-Dichloroethane (1,2-DCA) was detected in one of the 18 groundwater samples collected in 2004, with a concentration of 0.45 J µg/L.
- Acetone was detected in one of the 18 groundwater samples collected in 2004, with a concentration of 9.9 J µg/L.
- Chloroform was detected in nine of the 18 groundwater samples collected in 2004 with concentrations ranging from 0.24 J µg/L o 3.3 µg/L.
- Cis-1,2-Dichloroethene (cis-1,2-DCE) was detected in nine of the 18 groundwater samples collected in 2004 with concentrations ranging from 0.39 µg/L to 5.8 µg/L.
- Tetrachloroethene (PCE) was detected in eight of the 18 groundwater samples collected in 2004 with concentrations ranging from 0.21 µg/L to 7.1 µg/L.
- Toluene was detected in one of the 18 groundwater samples collected in 2004, with an estimated concentration of 0.34 J µg/L.
- Trans-1,2-Dichloroethene (trans-1,2-DCE) was detected in four of the 18 groundwater samples collected in 2004 with concentrations ranging from 0.29 µg/L to 1.7 µg/L.
- Trichloroethene (TCE) was detected in twelve of the 18 groundwater samples collected in 2004 with concentrations ranging from 0.23 µg/L to 510 µg/L.
- Vinyl chloride was detected in two of the 18 groundwater samples collected in 2004 with concentrations ranging from 0.39 µgL to 0.42 µg/L.

No VOCs were detected in samples collected in 2004 from wells CC-510-MW01, CC-510-MW03, CWM-183-MW18, CWM-183-MW19, CWM-183-MW25, and CWM-183-MW26.

Nineteen VOCs were detected in the groundwater samples collected in 2005, including:

- 1,1,1,2-PCA was detected in one of the 24 groundwater samples collected in 2005, with a concentration of 4.4 µg/L.
- 1,1,2,2-PCA was detected in ten of the 24 groundwater samples collected in 2005, with concentrations ranging from 0.37 J µg/L to 12,000 µg/L.
- 1,1,2-TCA was detected in three of the 24 groundwater samples collected in 2005, with concentrations ranging from 0.45 J µg/L to 6.7 µg/L.
- 1,1-DCE was detected in three of the 24 groundwater samples collected in 2005, with concentrations ranging from 0.42 J µg/L to 1.1 µg/L.
- 1,2,4-Trimethylbenzene was detected in one of the 24 groundwater samples collected in 2005, with an estimated concentration of 0.28 J µg/L.
- 1,2-DCA was detected in one of the 24 groundwater samples collected in 2005, with an

estimated concentration of 0.59 J µg/L.

- Acetone was detected in four of the 24 groundwater samples collected in 2005, with concentrations ranging from 2.1 J µg/L to 1500 µg/L.
- Bromodichloromethane was detected in three of the 24 groundwater samples collected in 2005, with concentrations ranging from 0.23 J µg/L to 1.5 µg/L.
- Carbon disulfide was detected in three of the 24 groundwater samples collected in 2005, with estimated concentrations ranging from 0.24 J µg/L to 0.28 J µg/L.
- Carbon tetrachloride was detected in one of the 24 groundwater samples collected in 2005, with an estimated concentration of 0.38 J µg/L.
- Chlorobenzene was detected in two of the 24 groundwater samples collected in 2005, with concentrations ranging from 3.1 µg/L to 4.9 µg/L.
- Chloroform was detected in 11 of the 24 groundwater samples collected in 2005 with concentrations ranging from 0.23 µg/L to 1,100 µg/L.
- Cis-1,2-DCE was detected in 11 of the 24 groundwater samples collected in 2005 with concentrations ranging from 0.45 µg/L to 49 µg/L.
- PCE was detected in nine of the 24 groundwater samples collected in 2005 with concentrations ranging from 0.42 µg/L to 110 µg/L.
- Toluene was detected in seven of the 24 groundwater samples collected in 2005, with concentrations ranging from 0.28 J µg/L to 4.9 µg/L.
- Trans-1,2-DCE was detected in five of the 24 groundwater samples collected in 2005 with concentrations ranging from 0.73 µg/L to 4.3 µg/L.
- TCE was detected in 15 of the 24 groundwater samples collected in 2005 with concentrations ranging from 0.28 µg/L to 3,600 µg/L.
- Vinyl chloride was detected in two of the 24 groundwater samples collected in 2005 with concentrations ranging from 0.38 µg/L to 1.7 µg/L.
- Total xylenes was detected in one of the 24 groundwater samples collected in 2005, with an estimated concentration of 0. 87 J µg/L.

No VOCs were detected in samples collected in 2005 from wells CWM-183-MW10, CWM-183-MW18, CWM-183-MW24, CWM-183-MW25, and CWM-183-MW26.

Eleven metals were detected in the groundwater sample collected from well CC-510-MW01.

5.5.2 2004/2005 RFI Surface Water Analytical Results

During the 2004/2005 RFI, six surface water samples, three in 2004 and three in 2005, were collected and analyzed for VOCs. The analytical results for VOCs detected in the 2004/2005 RFI surface water samples are presented in Table 5-7. Three VOCs were detected in the surface water samples. TCE was detected in five of the six surface water samples with concentrations ranging from 1.5 µg/L to 15 µg/L. 1,1,2,2-PCA was detected in three of the surface water samples with concentrations ranging from 0.9 µg/L to 3.3 µg/L. Cis-1,2-DCE was detected in four of the surface water samples with concentrations ranging from 0.23 µg/L to 0.71 µg/L. No VOCs were detected in surface water sample CC-510-SW-10.

5.5.3 2004/2005 RFI Sediment Analytical Results

During the 2004/2005 RFI, six sediment samples, three in 2004 and three in 2005, were collected at the same locations as the surface water samples and analyzed for VOCs. The analytical results for VOCs detected in the 2004/2005 RFI sediment samples are presented in Table 5-8. Three VOCs were detected in the sediment samples. Trichloroethene, cis-1,2-dichloroethene, and vinyl chloride were detected in sediment sample CC-510-SD-05 collected in 2004 at concentrations of 20 µg/L, 8.8 µg/L, and 17 µg/L, respectively. Trichloroethene was detected in sediment sample CC-510-SD-06 (5.4 µg/L) collected in 2004. No VOCs were detected in the sediment samples collected in 2005.

5.5.4 2004/2005 RFI Soil Analytical Results

During the 2004/2005 RFI, one depositional soil and five surface soil samples were collected and analyzed for metals. The analytical results for metals detected in the 2004/2005 RFI depositional soil and surface soil samples are presented in Table 5-9. Twenty-one of the 23 metals were detected in one or more of the surface soil and depositional soil samples. Only cadmium and silver were not detected in the surface and depositional soil samples.

5.6 Nature and Extent of Contamination

To evaluate the nature and extent of contamination at the Site, the VOC and metal results from the 2004/2005 RFI samples were assessed to identify contaminants at the Site. To aid in visualizing the extent of contamination, the historical VOC, SVOC, metals, and CWM breakdown product results for groundwater, surface water, sediment, surface and depositional soil, and subsurface soil samples collected during Shaw's SI and RI were also assessed. During the SI and RI for Training Area T-6, and the SI for Cane Creek Training Area, Shaw (Shaw, 2004) identified the results that exceeded SSSLs and ESVs; however, no further assessment was made concerning the nature and extent of contamination at the Site. Therefore, the historical VOC, SVOC, metals, and CWM breakdown product results from the SI and RI for Training Area T-6 and the SI for Cane Creek Training Area were assessed by MES in conjunction with the VOC and metals results from the 2004/2005 RFI to identify whether there were any contaminants in groundwater, surface water, sediment, surface soil, and subsurface soil at the Site. In cases where a groundwater monitoring well was sampled during multiple investigations, the most recent data for that well was used in the assessment.

Detected VOCs, non-PAH SVOCs, and CWM breakdown products were considered to be contaminants at the Site. Detected PAH compounds that exceeded the background screening values were considered to be contaminants at the Site. To evaluate the metal contaminants, a statistical evaluation was performed to identify metals that may be present at elevated concentrations as a result of site-related activities. The statistical evaluation consisted of a multi-tiered approach described in Section 4.7. Metal results that failed all three tiers were considered to be contaminants at the Site. A detailed description of the statistical evaluation for the metal results from the Shaw RI and SI investigations and the 2004/2005 RFI is discussed in Appendix E.

To evaluate which analytes were COPCs at the Site, the contaminants were compared to residential, construction worker, and groundskeeper SSSLs, and ESVs (ADEM, 2006 and IT, 2000). On behalf of the JPA, MES revised the SSSLs using updated toxicological properties provided in the *Alabama Risk-Based Corrective Action Guidance Manual (ARBCA)* (ADEM, 2006). The protocols outlined in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000), which accounted for exposure scenarios and media combinations specific to McClellan, were used to calculate the revised SSSLs. The revised SSSLs were used for the nature and extent of contamination and human health risk evaluations for this RFI.

5.6.1 Groundwater

Groundwater samples were not collected from the following monitoring well locations during the 2004/2005 RFI: CWM-183-MW01, CWM-183-MW02, CWM-183-MW07, CWM-183-MW08, CWM-183-MW15, and CWM-183-MW20. However, to aid in visualizing the extent of contamination of groundwater at the Site, an assessment of historical VOC results for these wells from previous investigations at the Site were incorporated into this report. Table F1 in Appendix F presents historical analytical results for VOCs detected in groundwater.

The historical SVOC, metal, and CWM breakdown product results from the RI at Training Area T-6 and the SI at Cane Creek Training Area were also assessed. These data are presented in the *Report of Findings* (Shaw, 2004). No groundwater samples were collected from well location CWM-183-MW05 during the 2001 SI, 2003 RI, or 2004/2005 RFI because the well was either dry or there was an insufficient amount of water.

To evaluate the nature and extent of groundwater contamination at the Site, the following analytical results were assessed to identify contaminants at the Site:

- VOC results for groundwater samples CWM-183-MW03, CWM-183-MW09, CWM-183-MW16, and CWM-183-MW17 collected in 2004 (Table 5-6).
- VOC results for groundwater samples CC-510-MW01 to CC-510-MW04, CWM-183-MW04, CWM-183-MW06, CWM-183-MW10 to CWM-183-MW14, CWM-183-MW18, CWM-183-MW19, and CWM-183-MW21 to CWM-183-MW31 collected in 2005 (Table 5-6).
- Metals results for groundwater sample CC-510-MW01 collected in 2005 (Table 5-6).
- Historical VOC results from the Training Area T-6 RI groundwater samples (Shaw, 2004) for wells that were not sampled during the 2004/2005 RFI, i.e., wells CWM-183-MW01, CWM-183-MW02, CWM-183-MW07, CWM-183-MW08, CWM-183-MW15, and CWM-183-MW20 (Table F1).
- Historical SVOC and CWM breakdown products results from the Training Area T-6 RI and Cane Creek Training Area SI groundwater samples, i.e., wells CC-510-MW01 to CC-510-MW04, and CWM-183-MW01 to CWM-183-MW24 (Shaw, 2004).
- Historical metal results for groundwater samples from wells CC-510-MW02 to CC-510-MW04, and CWM-183-MW01 to CWM-183-MW24 from the Training Area T-6 RI and Cane Creek Training Area SI (Shaw, 2004).

5.6.1.1 VOCs in Groundwater

Twenty VOCs were detected in the groundwater samples and are considered contaminants in groundwater at the Site. VOC results from the 2003 RI (Table F1) that were flagged indicating the analyte concentration was impacted by the associated laboratory method blank sample were not considered contaminants at the Site.

The VOC contaminants were compared to residential, construction worker, and groundskeeper SSSLs as presented in Table 5-10. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of VOC contamination in groundwater at the Site. VOC contaminants exceeding the residential SSSLs and considered to be COPCs at the Site are: 1,1,1,2-PCA, 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, acetone, bromodichloromethane, chloroform, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, and vinyl chloride. Figures 5-5 and 5-6 show the sample locations and VOC COPC concentrations exceeding residential SSSLs in groundwater collected from residuum wells and bedrock wells, respectively.

To aid in visualizing the extent of VOCs in groundwater, the total concentrations of VOCs in the residuum and bedrock groundwater bearing zones were separately summed and plotted. Figures 5-7 and 5-8 show the horizontal extent of total VOCs in the residuum and bedrock groundwater zones, respectively. The highest concentrations of VOCs in groundwater were found in residuum well CWM-183-MW23 (total VOCs 15,797 µg/L) located next to the concrete pads in the central-western portion of Training Area T-6, and well CWM-183-MW07 (total VOCs 14,590 µg/L) located immediately downgradient of the trenches in the northwestern portion of Training Area T-6. High concentrations of VOCs in groundwater were also detected in residuum wells CWM-183-MW06 (total VOCs 1,170 µg/L), CWM-183-MW09 (total VOCs 916 µg/L) and CWM-183-MW21 (total VOCs 487 µg/L) located near the concrete pads or within the trench area; and bedrock well CWM-183-MW20 (total VOCs 3,764 µg/L) located immediately downgradient of the trenches. Generally, the VOC concentrations decreased as the plume migrated horizontally further downgradient from the estimated source area (i.e., trenches and concrete pads).

A high detection of acetone (1,500 µg/L) was found in bedrock well CWM-183-MW30 located east of the Site near the South Branch of Cane Creek. Historically, spurious detections of acetone, the source of which is unknown, have been observed at McClellan. Because acetone is more miscible in water, and less easily adsorbed by soil or rock than chlorinated constituents such as TCE, unknown acetone source areas may be contributing to the acetone contamination seen at various McClellan sites, including the Site. There is no data or information indicating a possible source of acetone contamination at the Site, and therefore, no evidence that suggests acetone is Site-related.

Paired wells CWM-183-MW21 (residuum)/CWM-183-MW22 (bedrock) and CWM-183-MW06 (residuum)/CWM-183-MW11 (bedrock) indicate higher total VOC concentrations in the residuum zone compared to the bedrock zone within the estimated source area (i.e., trenches and concrete pads). Paired wells CWM-183-MW08 (residuum)/CWM-183-MW20 (bedrock), CWM-183-MW04 (residuum)/CWM-183-MW13 (bedrock), CWM-183-MW03 (residuum)/CWM-183-MW17 (bedrock), and CWM-183-MW15 (residuum)/CWM-183-MW16

(bedrock) indicate higher total VOC concentrations in the bedrock zone compared to the residuum zone downgradient from the estimated source area. VOC concentrations increased vertically further downgradient from the estimated source area.

The trend in VOC concentrations in groundwater over time was also assessed. Figures showing the VOC concentrations over time were constructed for groundwater wells CC-510-MW02, CC-510-MW04, CWM-183-MW03, CWM-183-MW04, CWM-183-MW06, CWM-183-MW11, CWM-183-MW12, CWM-183-MW13, CWM-183-MW14, CWM-183-MW22, and CWM-183-MW23, and are presented in Figures F1 to F11, respectively, in Appendix F. The residuum groundwater zone showed a general increase in VOCs over time within and around the estimated source area, immediately downgradient northeast of the concrete pads, and south of the concrete pads. The residuum groundwater zone showed a general decrease in VOCs further downgradient of the estimated source area near the South Branch of Cane Creek; with the exception of residuum well CC-510-MW04, located in the southeast corner of Cane Creek Training Area, which showed a slight increase in VOCs over time. The bedrock groundwater zone showed a general decrease in VOCs over time.

To assist in evaluating the vertical and horizontal extent of VOC contamination, data from the 2003 RI and the 2004/2005 RFI sampling events were contoured in three dimensions for 1,1,2,2-PCA, 1,1,2-TCA, chloroform, cis-1,2-DCE, PCE, TCE, and vinyl chloride. This contouring allows the simultaneous consideration of data values in horizontal and vertical dimensions and produces a volumetric shape representing the contaminant plume. The contouring was performed using EarthVision® (EV) geospatial modeling software developed by Dynamic Graphics, Inc. Data from the 2004 RFI sampling event for monitoring wells CWM-183-MW03, CWM-183-MW09, CWM-183-MW16, and CWM-183-MW17 were incorporated in the 2005 figure to provide a more complete model of the plume. It is important to note that the EV model is extremely precise in the geospatial rendering of each model, and contamination concentration isocontours may exist as thin layers or in small areas that are not easily represented on Figures with large linear scaling.

The following subsections discuss the lateral and vertical extent of 1,1,1,2-PCA, 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, bromodichloromethane, chloroform, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, and vinyl chloride based on the interpretation of groundwater data collected in 2003, 2004, and 2005 and the individual EV models for 1,1,2,2-PCA, 1,1,2-TCA, chloroform, cis-1,2-DCE, PCE, TCE, and vinyl chloride. VOC COPC concentrations exceeding groundwater SSSLs in residuum wells are included in Figure 5-5, and VOC COPC concentrations exceeding groundwater SSSLs in bedrock wells are included in Figure 5-6.

5.6.1.1.1 1,1,1,2-PCA in Groundwater

1,1,1,2-PCA concentrations exceeded the residential SSSL of 1.57 µg/L in two of the 22 residuum wells, well CWM-183-MW07 (2.2 µg/L) located immediately downgradient of the trenches and well CWM-183-MW23 (4.4 µg/L) located next to the former concrete pads (Figure 5-5). 1,1,2,2-PCA did not exceed the residential SSSL in bedrock wells at the Site.

Vertically, 1,1,1,2-PCA concentrations exceeded the residential SSSL in groundwater at an elevation of approximately 786 feet amsl in residuum well CWM-183-MW07 and approximately

780 feet amsl in residuum well CWM-183-MW23.

5.6.1.1.2 1,1,2,2-PCA in Groundwater

1,1,2,2-PCA concentrations exceeded the residential SSSL of 0.203 µg/L in nine of the 22 residuum wells (Figure 5-5). The highest concentrations of 1,1,2,2-PCA in the residuum groundwater zone were found in well CWM-183-MW23 (12,000 µg/L) located by the concrete pads, and in wells CWM-183-MW07 (8,600 µg/L) and CWM-183-MW09 (390 µg/L) located next to or immediately downgradient of the trenches. Two residuum monitoring wells, CWM-183-MW06 (32 µg/L) and CWM-183-MW08 (75 µg/L) located near or immediately downgradient of the trenches, had 1,1,2,2-PCA concentrations between 10 µg/L and 100 µg/L. The horizontal extent of the 1,1,2,2-PCA plume in the residuum is delineated by wells CC-510-MW04 (3.3 µg/L) and CWM-183-MW04 (0.69 µg/L), both of which are downgradient of the estimated source area, and by wells CWM-183-MW12 (4 µg/L) and CWM-183-MW21 (2.9 µg/L), which are upgradient of the trench area.

1,1,2,2-PCA concentrations exceeded the residential SSSL in five of the 12 bedrock wells (Figure 5-6). The highest concentrations of 1,1,2,2-PCA in the bedrock occurred along the limestone anticline in wells CWM-183-MW20 (18 µg/L), CWM-183-MW13 (9 µg/L), and CWM-183-MW29 (10 µg/L). Bedrock wells screened in the shale bedrock did not contain detectable amounts of 1,1,2,2-PCA.

Figure 5-9 depicts the estimated lateral extent of 1,1,2,2-PCA concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, the 1,1,2,2-PCA plume at 775 feet amsl is located near the western and central portion of Training Area T-6, extending from CWM-183-MW12 at the southern end of the plume to CWM-183-MW21 on the north, and CWM-183-MW22 on the west to CWM-183-MW10 on the east. The plume as indicated on this Figure shows only the highest concentration isocontour (above 20.3 µg/L). Mid-level (2.03 µg/L to 20.3 µg/L) and low concentration isocontours (0.203 µg/L to 2.03 µg/L) are present in the EV model at 775 feet amsl, but are not seen on the Figure due to the linear scale. No 1,1,2,2-PCA plumes were identified at 700 or 625 feet amsl in 2004/2005.

Figure 5-10 depicts the estimated lateral extent of 1,1,2,2-PCA concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-9. In the 2003 EV model, the 1,1,2,2-PCA plume at 775 feet amsl is larger than the 2004/2005 plume, and includes most of the northern portion of Training Area T-6, extending from CWM-183-MW12 on the south to CWM-183-MW24 on the north, and CWM-183-MW22 on the west to CWM-183-MW14 on the east. The plume as indicated on this Figure shows only the highest concentration isocontour (above 20.3 µg/L). Mid-level (2.03 µg/L to 20.3 µg/L) and low concentration isocontours (0.203 µg/L to 2.03 µg/L) are present in the EV model at 775 feet amsl, but are not seen on the Figure due to the linear scale. No 1,1,2,2-PCA plumes were identified at 700 or 625 feet amsl in 2003.

Vertically, 1,1,2,2-PCA concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 785 feet amsl in residuum wells CWM-183-MW06 and CWM-183-MW09 to a lower elevation of approximately 710 feet amsl in bedrock well CWM-183-

MW29.

Figure 5-11 depicts a cross section of the 2004/2005 1,1,2,2-PCA plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. At this cross section, the 1,1,2,2-PCA plume in the saturated zone migrates vertically to a depth of approximately 720 feet amsl and extends from an area at the groundwater table elevation south of well CWM-183-MW23 to an area situated below well CWM-183-MW07. A majority of the plume is indicated at the highest concentration isocontour (above 20.3 µg/L) with smaller concentration isocontours only partially visible due to the linear scale. A separate, small plume also exists at well CC-510-MW04 but is not visible in the figure at this vertical scale.

Figure 5-12 depicts the estimated vertical extent of the 2003 1,1,2,2-PCA plume, as interpreted by EV, for the same cross section as in Figure 5-11. In 2003 the plume area is larger than in 2004/2005, extending from a point on the water table south of CWM-183-MW23 to a point on the water table on the north nearly to well CC-510-MW04. The vertical extent of the plume is approximately 720 feet amsl, and the majority of the plume is occupied by the highest concentration isocontour (above 20.3 µg/L) with smaller concentration isocontours only partially visible due to the linear scale. Two separate, small plumes also exist at wells CC-510-MW02 and CC-510-MW04 but neither is visible in the figure at this vertical scale.

As indicated in the Figures F2 to F11 in Appendix F, 1,1,2,2-PCA has shown a general decrease over time, with the exception of residuum well CC-510-MW04 and CWM-183-MW12, which have shown a slight increase; and residuum well CWM-183-MW23, located in the vicinity of the concrete pads, which has shown a substantial increase.

5.6.1.1.3 1,1,2-TCA in Groundwater

1,1,2-TCA concentrations exceeded the residential SSSL of 0.720 µg/L in four of the 22 residuum wells, ranging from 1.4 µg/L in well CWM-183-MW09 to 64 µg/L in well CWM-183-MW07 immediately downgradient of the trenches (Figure 5-5). Three of these wells were located either at or immediately downgradient of the trenches, and the fourth well (CWM-183-MW23) is located at the concrete pads.

1,1,2-TCA concentrations exceeded the residential SSSL in only one of the 12 bedrock wells (Figure 5-6); well CWM-183-MW20 located immediately downgradient of the trenches with a concentration of 2.4 µg/L.

Figure 5-13 depicts the estimated lateral extent of 1,1,2-TCA concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, the 1,1,2-TCA plume at 775 feet amsl is generally in the western portion of Training Area T-6 near wells CWM-183-MW06, CWM-183-MW09, CWM-183-MW21 and CWM-183-MW22, and including well CWM-183-MW23. The plume includes only the low concentration isocontour (0.72 µg/L to 7.2 µg/L). No higher concentration isocontours are indicated. No 1,1,2-TCA plumes were identified at 700 or 625 feet amsl in 2004/2005.

Figure 5-14 depicts the estimated lateral extent of 1,1,2-TCA concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-13. In 2003, two portions of the 1,1,2-TCA plume are visible at 775 feet amsl. A larger portion of the plume is located in the northern part of Training Area T-6, and a smaller portion of the plume is situated to the south near well CWM-183-MW23. The larger portion of the plume includes wells CWM-183-MW22, CWM-183-MW23, CWM-183-MW09, CWM-183-MW07, CWM-183-MW08, and CWM-183-MW20, with a mid-level concentration isocontour (greater than 7.2 µg/L) surrounding well CWM-183-MW07. The remainder of the plume includes the low concentration isocontour (0.72 µg/L to 7.2 µg/L). No 1,1,2-TCA plumes were identified at 700 or 625 feet amsl in 2003.

Vertically, 1,1,2-TCA concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 786 feet amsl in residuum wells CWM-183-MW07 and CWM-183-MW09 to a lower elevation of approximately 725 feet amsl in bedrock well CWM-183-MW20.

Figure 5-15 depicts a cross section of the 2004/2005 1,1,2-TCA plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. At this cross section, the 1,1,2-TCA plume is situated in an area near well CWM-183-MW23 from the water table to a depth of approximately 770 feet amsl. The plume includes only the low concentration isocontour (0.72 µg/L to 7.2 µg/L). No higher concentration isocontours are indicated.

Figure 5-16 depicts the estimated vertical extent of the 2003 1,1,2-TCA plume, as interpreted by EV, for the same cross section as in Figure 5-15. In 2003 the plume is much larger than in 2004/2005 and is divided into two lobes. The upper lobe is located at the water table near CWM-183-MW07 to a depth of approximately 770 feet amsl and includes a low isoconcentration contour (0.72 µg/L to 7.2 µg/L) and a mid-level concentration isocontour (between 7.2 and 72 µg/L). The larger, lower lobe is situated below the water table at a depth ranging from approximately 775 feet amsl to approximately 705 feet amsl and includes only the low concentration isocontour (0.72 µg/L to 7.2 µg/L). This lobe of the 1,1,2-TCA plume migrates downward and stretches from an area between wells CWM-183-MW07 and CC-510-MW04.

As indicated in Figures F6, F10, and F11 in Appendix F, 1,1,2-TCA has shown a decrease over time, with the exception of residuum well CWM-183-MW23 located in the vicinity of the concrete pads, which has shown a slight increase.

5.6.1.1.4 1,2-Dichloroethane in Groundwater

1,2-DCA concentrations exceeded the residential SSSL of 0.448 µg/L in two of the 22 residuum wells, ranging from 0.49 J µg/L in CWM-183-MW07 to 0.49 µg/L in CWM-183-MW04 (Figure 5-5). CWM-183-MW04 is located downgradient of the concrete pads, and CWM-183-MW07 is located downgradient of the trenches. No 1,2-DCA concentrations were detected in groundwater collected from the bedrock wells.

Vertically, 1,2-DCA concentrations exceeded the residential SSSL in groundwater at an elevation of approximately 781 feet amsl in residuum well CWM-183-MW04 and approximately

786 feet amsl in residuum well CWM-183-MW07.

5.6.1.1.5 Bromodichloromethane in Groundwater

Bromodichloromethane concentrations exceeded the residential SSSL of 0.653 µg/L in two of the 22 residuum wells, ranging from 1.1 µg/L in well CWM-183-MW07 to 1.5 µg/L in well CWM-183-MW06 (Figure 5-5). CWM-183-MW06 is located downgradient of the concrete pads and CWM-183-MW07 is located downgradient of the trenches.

Vertically, bromodichloromethane concentrations exceeded the residential SSSL in groundwater at an elevation of approximately 786 feet amsl in residuum wells CWM-183-MW06 and CWM-183-MW07.

5.6.1.1.6 Chloroform in Groundwater

Chloroform concentrations exceeded the residential SSSL of 15.4 µg/L in three of the 22 residuum wells, ranging from 22 µg/L in well CWM-183-MW23 to 1,100 µg/L in well CWM-183-MW06 (Figure 5-5). Well CWM-183-MW06 is located between the trenches and the concrete pads, CWM-183-MW07 is located immediately downgradient of the trenches, and CWM-183-MW23 is located next to the concrete pads. Chloroform concentrations did not exceed the residential SSSL in the bedrock wells.

Figure 5-17 depicts the estimated lateral extent of chloroform concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, the chloroform plume is located near the central portion of Training Area T-6 including wells CWM-183-MW08 and CWM-183-MW20 on the north and near well CWM-183-MW12 on the south. A mid-level concentration isocontour (between 154 µg/L and 1,540 µg/L) occupies a large part of the plume and includes wells CWM-183-MW28, CWM-183-MW11, CWM-183-MW06, and CWM-183-MW07. No chloroform plumes were identified at 700 or 625 feet amsl in 2004/2005.

Figure 5-18 depicts the estimated lateral extent of chloroform concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-17. The 2003 chloroform plume is generally the same shape and size and in the same location as the 2004/2005 chloroform plume, however the mid-level concentration isocontour in 2003 is smaller and only includes wells CWM-183-MW06 and CWM-183-MW11. No chloroform plumes were identified at 700 or 625 feet amsl in 2003.

Vertically, chloroform concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 786 feet amsl in residuum wells CWM-183-MW06 and CWM-183-MW07 to a lower elevation of approximately 780 feet amsl in residuum well CWM-183-MW23.

Figure 5-19 depicts a cross section of the 2004/2005 chloroform plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. In this cross section, the chloroform plume extends from well CWM-183-MW23 to an area north of well CWM-183-MW07 from the water table to a depth of approximately 755 feet. A mid-level concentration isocontour (between 154 and 1,540 µg/L)

occupies a portion of this plume from the water table to a depth of approximately 770 feet amsl.

Figure 5-20 depicts the estimated vertical extent of the 2003 chloroform plume, as interpreted by EV, for the same cross section as in Figure 5-19. In the 2003 cross section, the chloroform plume extends approximately 150 feet further to the south compared to the 2004/2005 cross section. The estimated depth of the plume between wells CWM-183-MW11 and CWM-183-MW07 is 750 feet amsl.

As indicated in Figures F2, F3, F5 to F11 in Appendix F, chloroform has generally shown little change or slight decreases, with the exception of residuum wells CWM-183-MW06, CWM-183-MW12, and CWM-183-MW23 located in the vicinity of the concrete pads, which showed increases over time. Well CWM-183-MW06, located immediately downgradient of the concrete pads, showed a significant increase in chloroform over time.

5.6.1.1.7 Cis-1,2-DCE in Groundwater

Cis-1,2-DCE concentrations exceeded the residential SSSL of 15.5 µg/L in three of the 22 residuum wells, ranging from 40 µg/L in well CWM-183-MW21 to 180 µg/L in well CWM-183-MW07 (Figure 5-5). Residuum wells CWM-183-MW07 and CWM-183-MW21 are located at or near the trenches, and well CWM-183-MW23 is located at the concrete pads.

Cis-1,2-DCE concentrations exceeded the residential SSSL in one of the 12 bedrock wells, CWM-183-MW22 located next to the trenches at a concentration of 35 µg/L (Figure 5-6).

Figure 5-21 depicts the estimated lateral extent of cis-1,2-DCE concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, the cis-1,2-DCE plume is located in the northeastern portion of Training Area T-6 at 775 feet amsl including wells CWM-183-MW21, CWM-183-MW22, and CWM-183-MW23. No higher concentration isocontours are indicated. No cis-1,2-DCE plumes were identified at 700 or 625 feet amsl in 2004/2005.

Figure 5-22 depicts the estimated lateral extent of cis-1,2-DCE concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-21 In 2003, the cis-1,2-DCE plume covers most of the northern portion of Training Area T-6 and extends from wells CWM-183-MW21 and CWM-183-MW22 nearly to wells CWM-183-MW15 and CWM-183-MW16. No higher concentration isocontours are indicated. No cis-1,2-DCE plumes were identified at 700 or 625 feet amsl in 2003.

Vertically, cis-1,2-DCE concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 786 feet amsl in residuum well CWM-183-MW07, to a lower elevation of approximately 754 feet amsl in bedrock well CWM-183-MW22.

Figure 5-23 depicts a cross section of the 2004/2005 cis-1,2-DCE plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. The cis-1,2-DCE plume in this cross section is located vertically at the water table near well CWM-183-MW23. The plume is indicated migrating in three pieces northward and vertically through the saturated zone to a depth of approximately 745 feet amsl.

No higher concentration isocontours are indicated.

Figure 5-24 depicts the estimated vertical extent of the 2003 cis-1,2-DCE plume, as interpreted by EV, for the same cross section as in Figure 5-23. In 2003 the plume area is larger and is situated below the water table in the saturated zone under well CWM-183-MW23. The top portion of the plume is located north of well CWM-183-MW11 at the water table and extends to the north between wells CWM-183-MW07 and CC-510-MW02. The estimated depth of the plume is 725 feet amsl. No high concentration isocontours are indicated.

As indicated in Figures F1 to F4, F6, and F8 to F11 in Appendix F, cis-1,2-DCE has generally shown a decrease over time, with the exception of residuum wells CC-510-MW04 and CWM-183-MW23.

5.6.1.1.8 Tetrachloroethene in Groundwater

PCE concentrations exceeded the residential SSSL of 0.121 µg/L in seven of the 22 residuum wells, ranging from 0.42 J µg/L in well CC-510-MW04 to 110 µg/L in well CWM-183-MW23 (Figure 5-5). Most of these wells are located in the vicinity of the trenches or concrete pads, with the exception of CC-510-MW04 which is located along the western boundary of the Cane Creek Training Area.

PCE concentrations exceeded residential SSSL in eight of the 12 bedrock wells, ranging from 0.3 J µg/L in well CWM-183-MW17 to 28 µg/L in well CWM-183-MW20 (Figure 5-6). The highest concentration of PCE in the bedrock zone was found in well CWM-183-MW20 located along the limestone anticline near the trenches. The remaining bedrock wells with PCE concentrations exceeding residential SSSLs are CWM-183-MW27 (1.3 µg/L), CWM-183-MW22 (1.2 µg/L), CWM-183-MW13 (1.2 µg/L), CWM-183-MW11 (0.93 J µg/L), CWM-183-MW29 (0.71 J µg/L), and CWM-183-MW16 (0.53 J µg/L). Bedrock wells screened in the shale bedrock did not contain detectable amounts of PCE.

Figure 5-25 depicts the estimated lateral extent of PCE concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, the PCE plume is mainly located in the northwestern portion of Training Area T-6, with a high concentration isocontour (greater than 12.1 µg/L) at 775 feet amsl that includes wells CWM-183-MW23, CWM-183-MW06, CWM-183-MW11, and CWM-183-MW09. Surrounding the high concentration isocontour is a mid-level concentration isocontour (between 1.21 µg/L and 12.1 µg/L) that occupies most of the plume. A smaller concentration isocontour (between 0.121 µg/L and 1.21 µg/L) is only partially visible surrounding the mid-level concentration isocontour due to the linear scale of the figure. A small plume near wells CWM-183-MW13 and CWM-183-MW04 is indicated at 700 feet amsl. No PCE plume was identified at 625 feet amsl in 2004/2005.

Figure 5-26 depicts the estimated lateral extent of PCE concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-25. In the 2003 EV model, the PCE plume is mainly located in the northern portion of Training Area T-6, with a high concentration isocontour (greater than 12.1 µg/L) between wells CWM-183-MW08 and CWM-183-MW07 at 775 feet amsl. The mid-level concentration isocontour (between 1.21 µg/L

and 12.1 µg/L) at 775 feet amsl occupies a majority of the plume, however the low concentration isocontour (between 0.121 µg/L and 1.21 µg/L) is plainly visible along the outer portion of the plume. A smaller portion of the plume is also visible at 775 feet amsl in the southwestern section of Cane Creek Training Area and has a mid-level concentration isocontour in the southern half of the plume area. As the plume migrates downward it also is moving towards the northeast, still mostly within the Training Area T-6 boundary. The PCE plume at 700 feet amsl is much larger in 2003 than in 2004/2005 and is located in the northern half of Training Area T-6. The mid-level concentration isocontour (between 1.21 µg/L and 12.1 µg/L) at 700 feet amsl occupies a majority of the plume, with the low concentration isocontour (between 0.121 µg/L and 1.21 µg/) plainly visible along the outer portion of the plume. No PCE plume was identified at 625 feet amsl in 2003.

Vertically, PCE concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 786 feet amsl in residuum wells CWM-183-MW06, CWM-183-MW07, and CWM-183-MW09 to a lower elevation of approximately 711 feet amsl in bedrock wells CWM-183-MW16 and CWM-183-MW29.

Figure 5-27 depicts a cross section of the 2004/2005 PCE plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. The 2004/2005 cross section indicates a plume that begins at the water table near well CWM-183-MW23 and migrates vertically downward to a depth of approximately 720 feet amsl and horizontally to a position below well CC-510-MW04. A high concentration isocontour (greater than 121 µg/L) is located near the top of the plume to a depth of approximately 760 feet amsl, and a mid-level concentration plume occupies a majority of the rest of the plume.

Figure 5-28 depicts the estimated vertical extent of the 2003 PCE plume, as interpreted by EV, for the same cross section as in Figure 5-27. In 2003 the PCE plume is larger than in 2004/2005, with the plume touching the top of the saturated zone from well CWM-183-MW23 to approximately 100 feet north of well CWM-183-MW07. The portion of the plume in the saturated zone extends approximately 250 feet to the south of well CWM-183-MW23 and 200 feet to the north of well CWM-183-MW07 and migrates downward to a depth of approximately 690 feet amsl. A high concentration isocontour (greater than 121 µg/L) is indicated in two locations: near the water table, and near the center of the plume between depths of approximately 750 feet amsl and 710 feet amsl. A mid-level concentration plume (between 1.21 and 121 µg/L) occupies a majority of the plume area.

As indicated in Figures F2, F5, F6, and F8 to F11 in Appendix F, PCE has generally shown little change, with the exception of bedrock wells CWM-183-MW11, CWM-183-MW13, and CWM-183-MW22, which have shown significant decreases over time; and residuum well CWM-183-MW23 located in the vicinity of the concrete pads, which showed a significant increase over time.

5.6.1.1.9 Trans-1,2-DCE in Groundwater

Trans-1,2-DCE concentrations exceeded the residential SSSL of 30.7 µg/L in only one residuum well, CWM-183-MW07 located downgradient of the trenches, at a concentration of 42 µg/L. Trans-1,2-DCE did not exceed the residential SSSLs in the bedrock wells.

Vertically, trans-1,2-DCE concentrations exceeded the residential SSSL in groundwater at an elevation of approximately 786 feet amsl in residuum well CWM-183-MW07.

5.6.1.1.10 Trichloroethene in Groundwater

TCE concentrations exceeded the residential SSSL of 3.83 µg/L in ten of the 22 residuum wells, ranging from 8.5 µg/L in well CWM-183-MW04 to 5,500 µg/L in well CWM-183-MW07 (Figure 5-5). Residuum well CWM-183-MW07 is located immediately downgradient of the trenches and well CWM-183-MW23 (3,600 µg/L) is located adjacent to the concrete pads. High concentrations of TCE (between 400 µg/L and 1,000 µg/L) were also found in residuum wells CWM-183-MW09 (510 µg/L) and CWM-183-MW21 (430 µg/L) located within the trenches area. Residuum well CWM-183-MW08 located immediately downgradient of the trenches had a TCE concentration of 150 µg/L. The remaining residuum wells with TCE concentrations above the residential SSSL (CC-510-MW04, CWM-183-MW04, CWM-183-MW06, CWM-183-MW14, and CWM-183-MW15) generally indicate the horizontal extent of the TCE plume in the residuum, and may include interaction with South Branch of Cane Creek.

TCE concentrations exceeded the residential SSSL in eight of the 12 bedrock wells, ranging from 61 µg/L in well CWM-183-MW29 to 3,700 µg/L in well CWM-183-MW20 (Figure 5-6). well CWM-183-MW20 is located downgradient of the trenches along the limestone anticline. TCE was detected above the residential SSSL in the other bedrock wells screened in the limestone, CWM-183-MW16 (170 µg/L), CWM-183-MW22 (170 µg/L), CWM-183-MW13 (120 µg/L), CWM-183-MW27 (88 µg/L), CWM-183-MW11 (83 µg/L), CWM-183-MW17 (71 µg/L), and CWM-183-MW29 (61 µg/L). TCE was either not detected or detected below the residential SSSL in the bedrock wells screened in the shale bedrock.

The TCE concentration in bedrock well CWM-183-MW20 (3,700 µg/L) was significantly higher than its paired residuum well CWM-183-MW08 (150 µg/L). The difference may be attributed to the downward migration of TCE from well CWM-183-MW08 and may also include TCE from wells CWM-183-MW07 and CWM-183-MW09 following the northern groundwater flow vector as influenced by the limestone anticline. The bedrock wells CWM-183-MW13, CWM-183-MW11, CWM-183-MW27, CWM-183-MW17, and CWM-183-MW16 had higher concentrations of TCE relative to their corresponding residuum wells CWM-183-MW04, CWM-183-MW06, CC-510-MW04, CWM-183-MW03, and CWM-183-MW15, respectively. This indicates downward migration of the TCE plume.

Figure 5-29 depicts the estimated lateral extent of TCE concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, two portions of the TCE plume at 775 feet amsl are visible. The first portion is located mainly in the western and central part of Training Area T-6 and has a high concentration isocontour (greater than 383 µg/L) that occupies a large part of this portion of the plume. A mid-level concentration isocontour (between 38.3 and 383 µg/L) occupies the majority of the rest of the plume with the low concentration isocontour (between 3.83 and 38.3 µg/L) visible along the outer portion of the plume. The second portion of the plume at 775 feet amsl extends from the northeastern boundary of Training Area T-6 and covers the entire southern part of Cane Creek Training Area. A mid-level concentration

isocontour occupies a large part of this plume, surrounded by the low concentration isocontour. At 700 feet amsl, the TCE plume covers most of the central and eastern portion of Training Area T-6 and the southwest portion of Cane Creek Training Area. A mid-level concentration isocontour occupies a majority of this plume, surrounded by the low concentration isocontour. In the 625 feet amsl, the TCE plume is located within the Training Area T-6 boundary, and includes wells CWM-183-MW07, CWM-183-MW13, and CWM-183-MW14. No mid-level or high concentration isocontours were indicated at 625 feet amsl in 2004/2005.

Figure 5-30 depicts the estimated lateral extent of TCE concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-29. At 775 feet amsl the plume covers nearly all of the northern portion of Training Area T-6 from the northern, western, and eastern boundaries to monitoring well CWM-183-MW12 on the south. A high concentration isocontour (greater than 383 µg/L) occupies a large portion of the plume and a mid-level concentration isocontour (38.3 to 383 µg/L) occupies the majority of the remainder of the plume, with the low concentration isocontour (between 3.83 and 38.3 µg/L) visible along the outer portion of the plume. At 700 feet amsl the plume is smaller and includes wells CWM-183-MW09, CWM-183-MW08, CWM-183-MW20, and CWM-183-MW07. A majority of the plume is occupied by high and mid-level concentration isocontours. No TCE plume is indicated at 625 feet amsl in 2003.

Vertically, TCE concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 786 feet amsl in residuum wells CWM-183-MW06, CWM-183-MW07, and CWM-183-MW09 to a lower elevation of approximately 710 feet amsl in bedrock well CWM-183-MW29.

Figure 5-31 depicts a cross section of the 2004/2005 PCE plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. The 2004/2005 cross section indicates a large TCE plume with a high concentration isocontour (greater than 383 µg/L) at the water table near well CWM-183-MW23. From there the plume migrates vertically to a depth of approximately 610 feet amsl and horizontally to South Branch of Cane Creek. The plume is indicated at the water table at well CC-510-MW04, but not at well CWM-183-MW07. A mid-level concentration isocontour (between 38.3 and 383 µg/L) occupies a large portion of the plume extending to a depth of approximately 650 feet amsl.

Figure 5-32 depicts the estimated vertical extent of the 2003 TCE plume, as interpreted by EV, for the same cross section as in Figure 5-31. In 2003 the plume area is smaller than in 2004/2005, but contains a larger high concentration isocontour (above 383 µg/L) that occupies a majority of the plume. In 2003 the plume extends horizontally from a location of approximately 100 feet south of CWM-183-MW23 to CC-510-MW02, and vertically from the water table to a depth of approximately 690 feet amsl. A mid-level concentration isocontour surrounds the high level concentration isocontour.

As indicated in Figures F1 to F11 in Appendix F, TCE has shown a general decrease over time in residuum wells CC-510-MW02, CWM-183-MW03, and CWM-183-MW14; and bedrock wells CWM-183-MW11, CWM-183-MW13, and CWM-183-MW22. TCE has shown a general

increase over time in residuum wells CC-510-MW04 and CWM-183-MW23. TCE in residuum wells CWM-183-MW04 and CWM-183-MW06 has fluctuated over time but has shown decreases in recent time.

For well pair CWM-183-MW27 and CC-510-MW04 located in the southeast corner of Cane Creek Training Area near the South Branch of Cane Creek, TCE has increased over time in residuum well CC-510-MW04 and decreased in bedrock well CWM-183-MW27. This may be attributed to the upward vertical flow exhibited by this well cluster, as indicated in Table 5-3.

5.6.1.1.11 Vinyl Chloride in Groundwater

Vinyl chloride concentrations exceeded the residential SSSL of 0.0918 µg/L in three of the 22 residuum wells, ranging from 0.38 J µg/L at CC-510-MW02 to 1.7 µg/L in CWM-183-MW04 (Figure 5-5). Well CWM-183-MW04 is located downgradient of the concrete pads, well CC-510-MW02 is located near South Branch of Cane Creek, and well CWM-183-MW07 (1.2 µg/L) is located downgradient of the trenches. No vinyl chloride was detected in the bedrock wells at the Site.

Figure 5-33 depicts the estimated lateral extent of vinyl chloride concentrations in groundwater exceeding the residential SSSL in 2004/2005, as interpreted by EV, at depths of 775 feet amsl, 700 feet amsl, and 625 feet amsl. In the 2004/2005 EV model, vinyl chloride is separated into two plumes at 775 feet amsl, one in the east-central portion of Training Area T-6 and one in the central portion of Cane Creek Training Area. The plume located in Training Area T-6 has a small mid-concentration isocontour (between 0.92 and 9.2 µg/L) at paired wells CWM-183-MW13 and CWM-183-MW04. No vinyl chloride plumes were identified at 700 or 625 feet amsl in 2004/2005.

Figure 5-34 depicts the estimated lateral extent of vinyl chloride concentrations exceeding the residential SSSL in 2003, as interpreted by EV, at the same depth intervals as in Figure 5-33. In the 2003 EV model, vinyl chloride is separated into three plumes at 775 feet amsl, one in the northwest portion of Training Area T-6, one in the east-central portion of Training Area T-6, and one in the central portion of Cane Creek Training Area. No high concentration isocontours are indicated. No vinyl chloride plumes were identified at 700 or 625 feet amsl in 2003.

Vertically, vinyl chloride concentrations exceeded the residential SSSL in groundwater at an upper elevation of approximately 786 feet amsl in residuum well CWM-183-MW07 to a lower elevation of approximately 775 feet amsl in residuum well CC-510-MW02.

Figure 5-35 depicts a cross section of the 2004/2005 vinyl chloride plume, as interpreted by EV, from the southern portion of Training Area T-6 through a point in the northeast portion of Cane Creek Training Area. In 2004/2005 the vinyl chloride plume is indicated near the water table at wells CC-510-MW02 and CC-510-MW03 and in South Branch of Cane Creek. The plume extends from the water table to a depth of approximately 770 feet amsl. No high concentration isocontours were indicated.

Figure 5-36 depicts the estimated vertical extent of the 2003 vinyl chloride plume, as interpreted by EV, for the same cross section as in Figure 5-35. In 2003 the vinyl chloride is indicated in

two separate plumes, one plume is located near well CWM-183-MW07 and contains a mid-level concentration isocontour (between 0.9 to 9 µg/L) at the water table. The depth of this plume extends to approximately 770 feet amsl. The second plume is located near well CC-510-MW02 and does not appear to include South Branch of Cane Creek. This plume extends to a depth of approximately 770 feet amsl and has no indication of a higher concentration isocontour.

5.6.1.2 SVOCs and CWM Breakdown Products in Groundwater

Groundwater collected from seven wells in December 2001 and 27 wells from January to March 2003 were analyzed for SVOCs (Shaw, 2004). One SVOC, bis(2-ethylhexyl)phthalate, was detected in the groundwater sample for CWM-183-MW02 collected in 2001; however, no SVOCs were detected in the groundwater sample for this well collected in 2003 (Shaw, 2004). No SVOCs were detected in the other groundwater samples collected in 2001 and 2003. Therefore, no SVOCs were considered COPCs in groundwater at the Site.

CWM breakdown products were not detected in the groundwater samples at the Site.

5.6.1.3 Metals in Groundwater

Sixteen out of twenty-three metals were detected in one or more of the groundwater samples. Metal results from the RI and SI (Shaw, 2004) that were flagged indicating the analyte was also detected in the associated laboratory method or calibration blank were considered not detected. A statistical evaluation was performed to identify metals that may be present at elevated concentrations as a result of site-related activities. A detailed description of the statistical evaluation for the metal results is discussed in Appendix E. Based on the statistical evaluation, the following metal results were identified as site-related and are considered to be contaminants in groundwater at the Site:

- Nickel in residuum wells CC-510-MW03, CWM-183-MW01, CWM-183-MW06, CWM-183-MW07, and CWM-183-MW12.
- Thallium in residuum well CC-510-MW04.

The metal contaminants in groundwater were compared to residential, construction worker, and groundskeeper SSSLs as presented in Table 5-11. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of metal contamination in groundwater at the Site. Metal contaminants exceeding residential SSSLs were considered to be COPCs at the site. Nickel in residuum well CWM-183-MW06 and thallium in residuum well CC-510-MW04 exceeded the residential SSSLs. Figure 5-37 shows the sample locations and metal COPC concentrations exceeding SSSLs in residuum groundwater wells. No metal contaminants were found in the bedrock groundwater wells.

5.6.2 Surface Water

To evaluate the nature and extent of surface water contamination at the Site, the following analytical results were assessed to identify COPCs.

- VOC results from the 2004/2005 RFI surface water samples (Table 5-7).

- Historical VOC, SVOC, CWM breakdown products, and metals results for surface water samples from the SI and RI for Training Area T-6, and SI for Cane Creek Training Area (Shaw, 2004).

5.6.2.1 VOCs in Surface Water

Nine VOCs were detected in the surface water samples and are considered to be contaminants at the Site. VOC results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method blank sample, were not considered contaminants at the Site. The contaminants were compared to recreational SSSLs and ESVs as presented in Table 5-12. VOC contaminants exceeding SSSLs or ESVs were considered to be COPCs for the Site. 1,1,2,2-PCA and vinyl chloride exceeded the recreational SSSL. Figure 5-38 shows the sample locations and VOC COPC concentrations exceeding SSSLs in surface water. Vinyl chloride exceeded the ESV. Figure 5-39 shows the sample location and VOC COPC concentration exceeding the ESV in surface water.

5.6.2.2 SVOCs and CWM Breakdown Products in Surface Water

SVOCs and CWM breakdown products were not detected in the surface water samples at the Site.

5.6.2.3 Metals in Surface Water

Twelve out of twenty-three metals were detected in one or more of the surface water samples. Metal results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method or calibration blank were considered not detected. Based on the statistical evaluation (Appendix E), none of the metals were identified as site-related, and therefore, were not considered contaminants in surface water at the Site.

5.6.3 Sediment

To evaluate the nature and extent of sediment contamination at the Site, the following analytical results were assessed to identify COPCs.

- VOC results from the 2004/2005 RFI sediment samples (Table 5-8).
- Historical VOC, SVOC, CWM breakdown products, and metals results for sediment samples from the SI and RI for Training Area T-6 and SI for Cane Creek Training Area (Shaw, 2004).

5.6.3.1 VOCs in Sediment

Eleven VOCs were detected in the sediment samples and are considered to be contaminants in sediment at the Site. VOC results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method blank sample were not considered contaminants at the Site. The VOC contaminants were compared to recreational SSSLs and ESVs as presented in Table 5-13. VOC contaminants exceeding SSSLs or ESVs were considered to be COPCs for the site. No VOCs exceeded the recreational SSSLs

in sediment. Vinyl chloride exceeded the ESV. Figure 5-40 shows the sample locations and VOC COPC concentrations exceeding ESVs in sediment.

5.6.3.2 SVOCs and CWM Breakdown Products in Sediment

Two SVOCs, bis(2-ethylhexyl)phthalate and benzo(b)fluoranthene, were detected in the sediment sample CC-510-SW/SD03 and are considered to be contaminants in sediment at the Site. The SVOC contaminants were compared to the recreational SSSLs and ESVs as presented in Table 5-13. No SVOCs exceeded the recreational SSSLs in sediment. Bis(2-ethylhexyl)phthalate exceeded the ESV. Figure 5-40 shows the sample location and SVOC COPC concentration exceeding the ESV in sediment.

CWM breakdown products were not detected in the sediment samples at the Site.

5.6.3.3 Metals in Sediment

Nineteen out of twenty-three metals were detected in one or more of the sediment samples. Based on the statistical evaluation (Appendix E), none of the metals were identified as site-related, and therefore, were not considered contaminants in sediment at the Site.

5.6.4 Surface and Depositional Soil

To evaluate the nature and extent of surface and depositional soil contamination at the Site, the following analytical results were assessed to identify COPCs.

- Metals results for the surface and depositional soil samples from the 2004/2005 RFI (Table 5-9).
- Historical VOC, SVOC, CWM breakdown products, and metals results for the surface and depositional soil samples from the SI and RI for Training Area T-6 and SI for Cane Creek Training Area (Shaw, 2004).

5.6.4.1 VOCs in Surface and Depositional Soil

Twenty VOCs were detected in the surface and depositional soil samples and are considered to be contaminants at the Site. VOC results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method blank sample were not considered contaminants at the Site.

The VOC contaminants were compared to residential, construction worker, groundskeeper, and recreational SSSLs, and ESVs as presented in Table 5-14. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of VOC contamination in surface and depositional soil at the Site. VOC contaminants exceeding residential SSSLs or ESVs were considered to be COPCs at the Site. No VOC contaminants exceeded the residential SSSLs. 1,1,2,2-PCA, chloroform, PCE, styrene, and TCE exceeded the ESVs. Figure 5-41 shows the sample locations and VOC COPC concentrations exceeding ESVs in surface and depositional soil.

5.6.4.2 SVOCs and CWM Breakdown Products in Surface and Depositional Soil

Four non-PAH SVOCs were detected in the surface and depositional samples and were considered to be SVOC contaminants at the Site. Eleven PAH compounds were detected in the surface and depositional samples at the Site, however, none of the PAH compounds exceeded the background screening values and so were not considered to be contaminants at the Site. The SVOC contaminants were compared to residential, construction worker, groundskeeper, and recreational SSSLs, and ESVs as presented in Table 5-14. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of SVOC contamination in surface and depositional soil at the Site. SVOC contaminants exceeding residential SSSLs or ESVs were considered to be COPCs at the Site. No SVOC contaminants exceeded the residential SSSLs. Hexachlorobenzene and pentachlorophenol exceeded the ESVs. Figure 5-41 shows the sample location and SVOC COPC concentrations exceeding ESVs in surface and depositional soil.

CWM breakdown products were not detected in the surface and depositional soil samples at the Site.

5.6.4.3 Metals in Surface and Depositional Soil

Twenty-three metals were detected in one or more of the surface soil or depositional soil samples. Metal results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method or calibration blank were considered not detected. Based on the statistical evaluation (Appendix E), the following metal results were identified as site-related and are considered to be contaminants in surface and depositional soil at the Site:

- Antimony in sample CWM-183-GP05.
- Mercury in sample CWM-183-SS03.
- Nickel in sample CWM-183-MW06.
- Zinc in samples CC-510-DEP01 and CWM-183-GP05.

The metal contaminants in surface and depositional soil were compared to residential, construction worker, groundskeeper, and recreational SSSLs, and ESVs as presented in Table 5-14. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of metals contamination in surface and depositional soil at the Site. Metal contaminants exceeding residential SSSLs or ESVs were considered to be COPCs at the Site. Antimony and zinc exceeded the residential SSSLs. Figure 5-42 shows the sample locations and metal COPC concentrations exceeding SSSLs in surface and depositional soil. Antimony, mercury, nickel, and zinc exceeded ESVs. Figure 5-43 shows the sample locations and metal COPC concentrations exceeding ESVs in surface and depositional soil.

5.6.5 Subsurface Soil

To evaluate the nature and extent of subsurface soil contamination at the Site, the historical VOC, SVOC, and metals results for the subsurface soil samples from the SI and RI for Training

Area T-6 and SI for Cane Creek Training Area (Shaw, 2004) were assessed to identify the COPCs at the Site.

5.6.5.1 VOCs in Subsurface Soi1

Seventeen VOCs were detected in the subsurface soil samples and are considered to be contaminants at the Site. VOC results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method blank sample were not considered contaminants at the Site.

The VOC contaminants were compared to residential, groundskeeper, construction worker, and recreational SSSLs, and ESVs as presented in Table 5-15. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of VOC contamination in subsurface soil at the Site. 1,1,2,2-PCA exceeded the residential SSSL, and therefore, was considered a COPC at the Site. Figure 5-44 shows the sample locations and VOC COPC concentrations exceeding SSSLs in subsurface soil. 1,1,2,2-PCA, chloroform, PCE, TCE, and vinyl chloride exceeded the ESVs. Figure 5-45 shows the sample locations and VOC COPC concentrations exceeding ESVs in subsurface soil.

5.6.5.2 SVOCs and CWM Breakdown Products in Subsurface Soil

SVOC bis(2-ethylhexyl)phthalate and CWM breakdown product di-isopropylmethylphosphonic acid were detected in subsurface soil sample CWM-183-MW23 and are considered to be contaminants at the Site. The contaminants were compared to residential, construction worker, groundskeeper, and recreational SSSLs, and ESVs as presented in Table 5-15. Because bis(2-ethylhexyl)phthalate and di-isopropylmethylphosphonic acid were below the SSSLs, and bis(2-ethylhexyl)phthalate was below the ESV (no ESV has been established for di-isopropylmethylphosphonic acid), they are not considered COPCs at the Site.

5.6.5.3 Metals in Subsurface Soil

Twenty-two out of 23 metals were detected in one or more of the subsurface soil samples. Metal results from Shaw's RI and SI (Shaw, 2004) that were flagged indicating the analyte concentration was impacted by the associated laboratory method or calibration blank were considered not detected. Based on the statistical evaluation (Appendix E), the cadmium result for sample CC-510-MW02 was identified as site-related and is considered a contaminant in subsurface soil at the Site.

The cadmium contaminant in surface and depositional soil was compared to residential, construction worker, groundskeeper, and recreational SSSLs, and ESV as presented in Table 5-15. Residential SSSLs, the most stringent of the screening levels, were used to evaluate the nature and extent of metals contamination in subsurface soil at the Site. Metal contaminants exceeding residential SSSLs or ESVs were considered to be COPCs at the Site. Because the cadmium result was below the SSSLs and ESV, it is not considered a COPC in subsurface soil at the Site.

5.6.6 Nature and Extent Conclusions

The goal of improving the definition of contaminant nature and extent at the Site has been accomplished. The additional sampling completed as part of this RFI effort has enabled a more complete understanding of the distribution of contaminants in various environmental media and confirmed the nature of those contaminants. Important conclusions regarding nature and extent of contamination at the Site are as follows:

- Groundwater VOC contamination exceeding the residential SSSLs included 1,1,1,2-PCA, 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, acetone, bromodichloromethane, chloroform, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, vinyl chloride.
- Groundwater metal contamination exceeding the residential SSSLs included nickel and thallium.
- SVOCs and CWM breakdown products were not detected in groundwater at the Site.
- VOCs following groundwater flow have migrated downgradient from the estimated contamination source area located at the area surrounding the trenches and concrete pads.
- Groundwater VOC contamination exceeding SSSLs has been horizontally and vertically delineated at the Site.
- Surface water VOC contamination exceeding SSSLs included 1,1,2,2-PCA and vinyl chloride. Vinyl chloride exceeded the ESV in surface water.
- SVOCs and CWM breakdown products were not detected in surface water at the Site.
- No metals were identified as being Site-related in surface water or sediment at the Site.
- No VOCs exceeded SSSLs in sediment, however, vinyl chloride exceeded the ESV in sediment.
- No SVOCs exceeded SSSLs in sediment however, bis(2-ethylhexyl)phthalate exceeded the ESV in sediment.
- CWM breakdown products were not detected in sediment at the Site.
- No VOCs exceeded SSSLs in surface and depositional soil at the Site, however, 1,1,2,2-PCA, chloroform, PCE, styrene, and TCE exceeded ESVs in surface and depositional soil at the Site.
- No SVOCs exceeded SSSLs in surface and depositional soil at the Site, however, hexachlorobenzene and pentachlorophenol exceeded ESVs in one depositional soil sample located in the Cane Creek Training Area near the South Branch of Cane Creek.
- Surface and depositional soil metal contamination exceeding SSSLs included antimony and zinc. Antimony, mercury, nickel, and zinc exceeded ESVs in surface and depositional soil at the Site.
- CWM breakdown products were not detected in surface and depositional soil at the Site.
- Subsurface soil VOC contamination exceeding SSSLs included 1,1,2,2-PCA. Subsurface soil VOC contamination exceeding ESVs included 1,1,2,2-PCA, chloroform, PCE, TCE, and vinyl chloride.
- No subsurface soil SVOC or CWM breakdown product contamination exceeded SSSLs or ESVs.
- No metals exceeded SSSLs or ESVs in subsurface soil at the Site.

Given the consistent and corroborative nature of the data collected during this RFI and previous

investigations, and the limited number and defined extent of COPCs, this RFI has been successful in defining both the nature and extent of environmental contamination at the Site.

6.0 CONTAMINANT FATE AND TRANSPORT

The fate and transport of contaminants when released to the environment will govern the potential for exposures to human and ecological receptors. Contaminants in environmental media may result in direct exposure (e.g., plants exposed to surface soil) or indirect exposure (animals eating plants exposed to surface soil) and have the potential to migrate to other environmental media or areas. This section discusses the mechanisms by which contaminants can be transported.

6.1 Fate and Transport in Groundwater

Contaminants in groundwater can be transported in either a dissolved phase or a soil-adsorbed state in the direction of groundwater flow. Regional groundwater flow directions in residuum and bedrock zones typically follow site topography, which, at Training Area T-6 slopes to the northeast towards South Branch of Cane Creek. However, as described in Section 2.2.2 of this report, an anticlinal limestone strike traverses the Site in a southwest to northeast direction, and may have a local influence on the groundwater flow and contaminant transport by introducing preferential flow pathways in the fractured limestone, limestone karst, solution cavities, and void spaces recorded during drilling.

Tables 5-2 and 5-3 show the horizontal and vertical hydraulic gradients, respectively, for groundwater. As discussed in Section 5.1, horizontal gradients are steeper at Howitzer Hill in the southwest portion of Training Area T-6, and flatten out as groundwater flow nears South Branch of Cane Creek. Vertical gradients averaged 0.03 ft/ft at Training Area T-6, indicating a moderate to high potential for downward movement of groundwater. At well pairs CWM-183-MW21/CWM-183-MW22, and CWM-183-MW15/CWM-183-MW16, the vertical gradient indicates a slight potential for downward movement of groundwater. Near South Branch of Cane Creek, at well pair CC-510-MW04/CWM-183-MW27, the vertical gradient indicates a slight potential for upward movement of groundwater, possibly due to the influence of South Branch of Cane Creek.

The distribution of total VOCs at the Site indicate a VOC plume that follows the local groundwater flow direction and provides evidence of preferential flow along the limestone strike. The transport of VOC contaminants from the estimated source area is generally seen in the residuum and limestone bedrock moving towards South Branch of Cane Creek to the northeast with a downward migration of the denser chlorinated hydrocarbons. Because chlorinated hydrocarbons are moderately soluble in water, the most likely fate and transport process for these VOCs is aqueous solubility. Chlorinated hydrocarbons are also attracted to the subsurface soil matrix through a combination of physical and chemical forces and typically move more slowly than groundwater. With molecular structures denser than water, these compounds tend to sink in a vertical direction as they migrate horizontally following the flow of groundwater, and may exist as a dense, nonaqueous phase liquid (DNAPL) within the limestone karst, solution cavities, and void spaces.

Local topography in the northeast portion of Cane Creek Training Area slopes southwest towards South Branch of Cane Creek. Shallow groundwater flow on this side of the creek is not well

defined, but is assumed to follow local topography toward the creek. No VOC contamination was observed on the east side of South Branch of Cane Creek in the residuum groundwater; however, bedrock groundwater flow from the southwest may contain VOC contamination.

Horizontal and vertical plume maps predicted by EV and described in Section 5.6.1.1 of this report show the estimated extent of the major VOC contaminants of concern. The following sections discuss the properties of these VOCs and describe the differences in the 2003 and 2004/2005 plumes as modeled by EV. As indicated in Section 5.6.1, four groundwater samples collected in 2004 were combined with groundwater analytical data collected in 2005 to create the 2004/2005 plumes. As indicated in Section 5.0, horizontal and vertical delineation of VOC contamination is adequate in the residuum and bedrock wells at the Site.

6.1.1 1,1,2,2-PCA

1,1,2,2-PCA is a colorless chlorinated hydrocarbon with a molecular weight of 167.8 and a density (at 20 degrees centigrade [°C]) of 1.6 grams per milliliter (g/mL). It is soluble in water (2.83 grams per liter [g/L] at 25°C), is volatile in air (vapor pressure of 4.62 mm Hg at 25°C), and is highly mobile in groundwater. When released into surface soils or surface water, much of the chemical will evaporate back to the air while the remainder may eventually break down due to its volatility and reactions with water. However, once 1,1,2,2-PCA is transported to groundwater through infiltration (discussed in Section 6.4), breakdown of the chemical is slow, with half of the 1,1,2,2-PCA expected to disappear from groundwater in approximately 13 months (Agency for Toxic Substances and Disease Registry [ATSDR], 2006).

The extent of 1,1,2,2-PCA contamination in groundwater is described in Section 5.6.1.1.2. In addition, the vertical and horizontal extent of 1,1,2,2-PCA contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

In the EV model, the 2003 1,1,2,2-PCA plume occupies a larger horizontal area than the 2004/2005 1,1,2,2-PCA plume. Some differences in portions of the 2003 and 2004/2005 plume, as modeled by EV, can be correlated to the difference in sample sets. For instance, in 2004/2005, monitoring wells CWM-183-MW07, CWM-183-MW08, and CWM-183-MW20 were not sampled and no data set was included in the EV model. Because of this lack of data, the main portion of the 2004/2005 plume as modeled by EV does not extend as far towards the north and east. Other portions of the EV model with similar data sets in 2003 and 2004/2005 may be responsible for slight differences in the lateral extent of the plume. In 2003 1,1,2,2-PCA was detected at 5 µg/L in wells CWM-183-MW14 and CWM-183-MW24 but was not detected in these two wells in 2004/2005. The lack of detected concentrations of 1,1,2,2-PCA in 2004/2005 may indicate the occurrence of natural attenuation in groundwater at these well locations.

6.1.2 1,1,2-TCA

1,1,2-TCA is a breakdown product of 1,1,2,2-PCA through anaerobic degradation. 1,1,2-TCA is a colorless chlorinated hydrocarbon with a molecular weight of 133.4 and a density (at 20°C) of 1.44 g/mL. It is soluble in water (4.4 g/L at 20°C), is volatile in air (vapor pressure of 22.49 mm

Hg at 25°C), and is highly mobile in groundwater. When 1,1,2-TCA is directly released into the environment, most of the compound is released into the air, although some may find its way into groundwater. Breakdown of 1,1,2-TCA in groundwater is slow, and may remain in groundwater for greater than 16 weeks to several years (ATSDR, 1989).

The extent of 1,1,2-TCA contamination in groundwater is described in Section 5.6.1.1.3. In addition, the vertical and horizontal extent of 1,1,2,-TCA contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

In the EV model, the 2003 1,1,2-TCA plume occupies a larger horizontal area than the 2004/2005 1,1,2-TCA plume. Some differences in portions of the 2003 and 2004/2005 plume as modeled by EV can be correlated to the difference in sample sets. For instance, in 2004/2005, monitoring wells CWM-183-MW07, CWM-183-MW08, and CWM-183-MW20 were not sampled and no data set was included in the EV model. Because of this lack of data, the main portion of the 2004/2005 plume as modeled by EV does not extend as far towards the north and east.

6.1.3 Cis-1,2-DCE

Cis-1,2-DCE is a colorless chlorinated hydrocarbon with a molecular weight of 96.95 and a density (at 20°C) of 1.284 g/mL. It is soluble in water (3.5 g/L at 20°C) is highly volatile in air (vapor pressure of 180 mm Hg at 20°C), and is highly mobile in groundwater. When released, most of the cis-1,2-DCE will evaporate back to the air where it has a half life of approximately 5 to 12 days. Once cis-1,2-DCE dissolves into groundwater, it is slowly broken down with a half-life of 13 to 48 weeks. Some cis-1,2-DCE may be broken down into vinyl chloride (ATSDR, 1996).

The extent of cis-1,2-DCE contamination in groundwater is described in Section 5.6.1.1.7. In addition, the vertical and horizontal extent of cis-1,2-DCE contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

In the EV model, the 2003 cis-1,2-DCE plume occupies a larger horizontal area than the 2004/2005 cis-1,2-DCE plume. Some differences in portions of the 2003 and 2004/2005 plume as modeled by EV can be correlated to the difference in sample sets. For instance, in 2004/2005, monitoring wells CWM-183-MW07, CWM-183-MW08, CWM-183-MW15, and CWM-183-MW20 were not sampled and no data set was included in the EV model. Because of this lack of data, the main portion of the 2004/2005 plume as modeled by EV does not extend as far towards the north and east.

6.1.4 Chloroform

Chloroform is a colorless chlorinated hydrocarbon with a molecular weight of 119.38 and a density (at 20°C) of 1.48 g/mL. It is highly soluble in water (7.22 g/L at 20°C), is volatile in air (vapor pressure of 160 mm Hg at 20°C), and is highly mobile in groundwater. When released into the environment chloroform will evaporate rapidly into the air. Chloroform not released into the air will enter the ground but does not adsorb readily to soil and will migrate quickly

through the unsaturated zone to the groundwater table. Once in groundwater chloroform will degrade very slowly (ATSDR, 1997).

The extent of chloroform contamination in groundwater is described in Section 5.6.1.1.6. In addition, the vertical and horizontal extent of chloroform contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

In the EV model, the chloroform plumes modeled in 2003 and 2004/2005 are similar in shape and size. The main difference is that the 2003 plume extends further to the south, which may indicate the occurrence of natural degradation in this portion of the plume.

6.1.5 PCE

PCE is a chlorinated solvent with a molecular weight of 165.83 and a density (at 20°C) of 1.623 g/mL. It is slightly soluble in water (0.15 g/L at 25°C), is volatile in air (vapor pressure of 18.47 mm Hg at 25°C), and is moderately mobile in groundwater. When released, most of the PCE will evaporate back to the air where it can remain for months before being broken down into other chemicals or is brought back down to the soil and surface water by rain. PCE that does migrate to groundwater may remain for several months without being broken down (ATSDR, 1997).

The extent of PCE contamination in groundwater is described in Section 5.6.1.1.8. In addition, the vertical and horizontal extent of PCE contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

In the EV model, the 2003 PCE plume occupies a larger vertical and horizontal area than the 2004/2005 PCE plume. Some differences in portions of the 2003 and 2004/2005 plume as modeled by EV can be correlated to the difference in sample sets. For instance, in 2004/2005, monitoring wells CWM-183-MW07, CWM-183-MW08, and CWM-183-MW20 were not sampled and no data set was included in the EV model. Because of this lack of data, the main portion of the 2004/2005 plume as modeled by EV does not extend as far towards the north and east. In addition, well CWM-183-MW25 was not sampled in 2003, which may have limited the northern plume extent in the 2003 model. Other portions of the EV model with similar data sets in 2003 and 2004/2005 may be responsible for the difference in the vertical and horizontal extent of the plume. The PCE concentration in well CWM-183-MW11 was 27 µg/L in 2003 and 0.93 µg/L in 2004/2005, which may indicate the occurrence of natural attenuation at this well location.

6.1.6 TCE

TCE is a colorless chlorinated solvent with a molecular weight of 131.40 and a density (at 20°C) of 1.465 g/mL. It is slightly soluble in water (1.070 g/L at 20°C), is volatile in air (vapor pressure of 74 mm Hg at 25°C), and is moderately mobile in groundwater. When released, most of the TCE will evaporate back to the air where half may be broken down in a week. TCE that does migrate to groundwater is slowly broken down in days or weeks (ATSDR, 1997).

The extent of TCE contamination in groundwater is described in Section 5.6.1.1.10. In addition, the vertical and horizontal extent of TCE contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

In the EV model, the 2004/2005 TCE plume occupies a larger vertical and horizontal area than the 2003 PCE plume. However, the larger high concentration plume in 2003 may be attributed to the presence of data at wells CWM-183-MW07, CWM-183-MW08, CWM-183-MW15, and CWM-183-MW20 in 2003. The vertical extent of the plume in the 2004/2005 model extends deeper than is indicated in 2003, which may be a result of a data point available in 2004/2005 at well CWM-183-MW28 that was not available in 2003. The TCE plume in 2004/2005 may also extend further towards the northeast as a result of two data points at wells CWM-183-MW30 and CWM-183-MW31 not available in 2003.

6.1.7 Vinyl Chloride

Vinyl chloride is a colorless chlorinated compound generally seen as a breakdown product from other chlorinated solvents with a molecular weight of 62.5 and a density (at 20°C) of 0.911 g/mL. It is slightly soluble in water (2.76 g/L at 25°C), and is highly volatile in air (vapor pressure of 2,600 mm Hg at 25°C). When released, most of the vinyl chloride will evaporate back to the air where it may be broken down in days, resulting in the formation of chemicals such as HCl, formaldehyde, and CO_2. Some vinyl chloride can dissolve in water and will eventually be broken down. Much of the vinyl chloride found in groundwater is a result of the breakdown of other chlorinated solvents such as TCE and PCE (ATSDR, 2006).

The extent of vinyl chloride contamination in groundwater is described in Section 5.6.1.1.11. In addition, the vertical and horizontal extent of vinyl chloride contamination was modeled in three dimensions by EV for data collected in 2003 and 2004/2005.

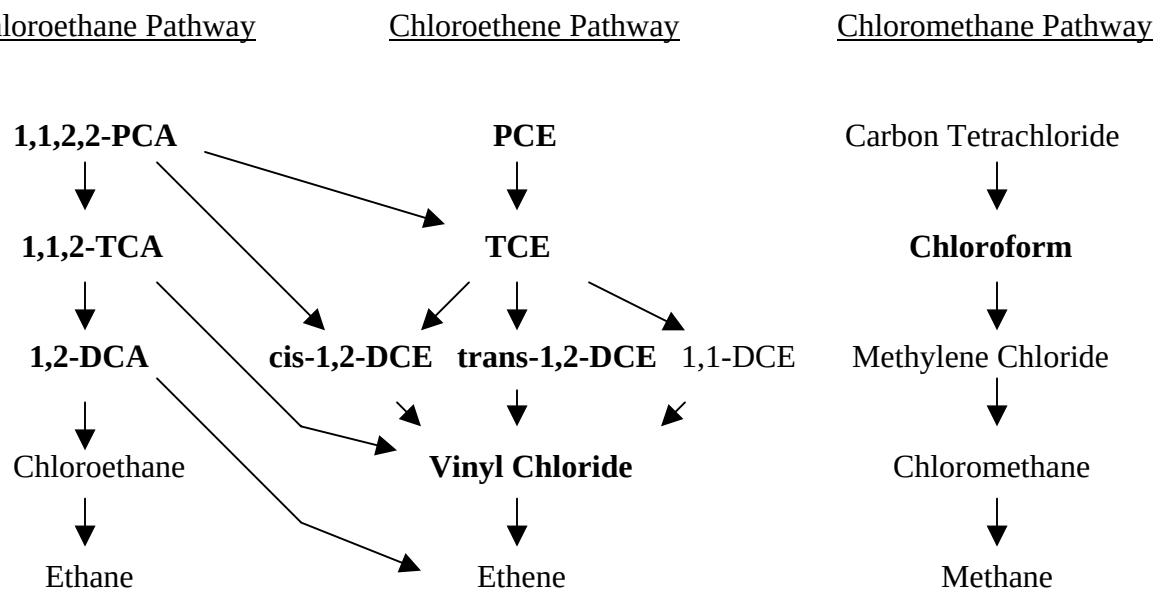
In the EV model, an additional vinyl chloride plume is modeled in 2003 that does not exist in the 2004/2005 model. The additional 2003 plume, located around the mid-screen interval of well CWM-183-MW07, is most likely a product of the additional data point available at CWM-183-MW07 in 2003. The second portion of the 2003 plume, located near South Branch of Cane Creek, is similar in size and shape to the vinyl chloride plume modeled for 2004/2005.

6.1.8 Metals

Metal COPCs identified in groundwater at the Site included nickel in residuum well CWM-183-MW06 located near the concrete pads, and thallium in residuum well CC-510-MW04 located adjacent to the southwest border of the Cane Creek Training Area. In general, metals are not degradable through biological or chemical actions and are typically considered to be persistent in the environment. In addition, metals tend to sorb easily to soil particles and are not highly mobile under natural subsurface conditions. As a result, metals generally do not move significant distances with groundwater flow.

6.1.9 Natural Degradation of Chlorinated Solvents in Groundwater

Natural degradation of chlorinated solvents occurs under anaerobic conditions in the environment through the process of chemical reduction (dechlorination). Highly oxidized chemicals such as 1,1,2,2-PCA, PCE, TCE, and chloroform have a high reduction potential and are resistant to further oxidation under aerobic conditions. The anaerobic pathways for the reduction of chloroethanes, chloroethenes, and chloromethanes are as follows (Fetter, 1993; Field, 2004):



Of the twelve VOCs identified as constituents of concern (COCs) in groundwater at the Site (see Section 7.3 for details concerning the identification of the COCs) nine are included in these anaerobic pathways in bold face type. Evaluation of the anaerobic degradation pathways at the Site is described in the following subsections, and summarized in Table 6-1. Figures F1, F2, and F4 to F11 in Appendix F presents the concentrations of chlorinated solvents over time for ten of the 15 monitoring wells that were assessed for anaerobic degradation. Contaminant extent is discussed in Section 5.0.

Monitoring Well CC-510-MW02
Residuum well CC-510-MW02, located near the South Branch of Cane Creek, was within the EV-modeled 1,1,2,2-PCA, TCE, and vinyl chloride plume boundaries.

Chloroethane Pathway: No chlorinated ethanes were detected in the 2005 groundwater sample collected from CC-510-MW02. A trace amount of 1,1,2,2-PCA (0.97 µg/L) was detected in the 2003 groundwater sample.

Chloroethene Pathway: TCE (1.3 µg/L), cis-1,2-DCE (1.8 µg/L), and vinyl chloride (0.38 µg/L) were detected in the 2005 groundwater sample collected from CC-510-MW02. Trans-1,2-DCE was detected in 2003. The presence of these chlorinated ethenes indicates anaerobic degradation

of TCE is occurring at this location.

Chloromethane Pathway: No chlorinated methanes were detected at this location.

Monitoring Well CC-510-MW04
Residuum well CC-510-MW04, located near the South Branch of Cane Creek, was within the EV-modeled 1,1,2,2-PCA, PCE, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (3.3 µg/L) was detected in the 2005 groundwater sample collected from well CC-510-MW04. No other chlorinated ethanes have historically been detected. At this time, there is no evidence of anaerobic degradation of chloroethanes occurring at CC-510-MW04.

Chloroethene Pathway: PCE (0.42 µg/L), TCE (71 µg/L), and cis-1,2-DCE (1.1 µg/L) were detected in the 2005 groundwater sample collected from CC-510-MW04. The presence of these chlorinated ethenes indicate anaerobic degradation of TCE is occurring at this location.

Chloromethane Pathway: Trace amounts of chloroform were detected at this location in 2003 and 2005.

Monitoring Well CWM-183-MW04
Residuum well CWM-183-MW04, located downgradient of the concrete pads, was within the EV-modeled 1,1,2,2-PCA, PCE, TCE, and vinyl chloride plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (0.69 µg/L) and 1,2-DCA (0.59 µg/L) were detected in the 2005 groundwater sample collected from well CWM-183-MW04. Historically 1,1,2,2-PCA, 1,1,2,-TCA, and 1,2-DCA have been detected in groundwater collected from this location indicating the occurrence of natural degradation.

Chloroethene Pathway: TCE (8.5 µg/L), cis-1,2-DCE (5.9 µg/L), trans-1,2-DCE (0.96 µg/L), and vinyl chloride (1.7 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW04. Historically PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride have been detected at CWM-183-MW04. The presence of these chlorinated ethenes indicates anaerobic degradation is occurring at this location.

Chloromethane Pathway: No chlorinated methanes were detected at this location.

Monitoring Well CWM-183-MW06
Residuum well CWM-183-MW06, located near the concrete pads, was within the EV-modeled 1,1,2,2-PCA, chloroform, PCE, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (32 µg/L) was detected in the 2005 groundwater sample collected from well CWM-183-MW06. No other chlorinated ethanes have historically been detected. At this time there is no evidence of anaerobic degradation of chloroethanes occurring at CWM-183-MW06.

Chloroethene Pathway: PCE (0.76 µg/L) and TCE (35 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW06. Historically PCE, TCE, and cis-1,2-DCE have been detected indicating anaerobic degradation is occurring at this location.

Chloromethane Pathway: Chloroform (1,100 µg/L) and carbon tetrachloride (0.38 µg/L) were detected in groundwater collected from well CWM-183-MW06 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW06.

Monitoring Well CWM-183-MW10
Residuum well CWM-183-MW10, located downgradient of the concrete pads, was within the EV-modeled PCE and TCE plume boundaries.

Chloroethane Pathway: No chlorinated ethanes were detected at this location.

Chloroethene Pathway: A trace amount of TCE (0.23 µg/L) was detected in the 2004 groundwater sample collected from CWM-183-MW10, but was not detected in the groundwater sample collected in 2005. No other chlorinated ethenes were detected.

Chloromethane Pathway: No chlorinated methanes were detected at this location.

Monitoring Well CWM-183-MW11
Bedrock well CWM-183-MW11, located immediately downgradient of the concrete pads, was within the EV-modeled 1,1,2,2-PCA, 1,1,2-TCA, chloroform, PCE, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (0.37 µg/L) and 1,1,2-TCA (0.45 µg/L) were detected in the 2005 groundwater sample collected from well CWM-183-MW11. The presence of 1,1,2-TCA indicates natural degradation is evident in groundwater collected from this location.

Chloroethene Pathway: PCE (0.93 µg/L), TCE (83 µg/L), and cis-1,2-DCE (3.9 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW11. Historically PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCE have been detected at CWM-183-MW11. The presence of these chlorinated ethenes indicates anaerobic degradation is occurring at this location.

Chloromethane Pathway: Chloroform (0.56 µg/L) was detected in groundwater collected from well CWM-183-MW11 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW11.

Monitoring Well CWM-183-MW12
Residuum well CWM-183-MW12, located south of the concrete pads, was within the EV-modeled 1,1,2,2-PCA, chloroform, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (4 µg/L) was detected in the 2005 groundwater sample collected from well CWM-183-MW12. No other chlorinated ethanes have historically been detected. At this time there is no evidence of anaerobic degradation of chloroethanes occurring

at CWM-183-MW12.

Chloroethene Pathway: TCE (2.8 µg/L) was detected in the 2005 groundwater sample collected from well CWM-183-MW12. No other chlorinated ethenes have historically been detected. At this time there is no evidence of anaerobic degradation of chloroethenes occurring at CWM-183-MW12.

Chloromethane Pathway: Chloroform (4.5 µg/L) was detected in groundwater collected from well CWM-183-MW12 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW12.

Monitoring Well CWM-183-MW13
Bedrock well CWM-183-MW13, located downgradient of the concrete pads, was within the EV-modeled 1,1,2,2-PCA, cis-1,2-DCE, PCE, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (9 µg/L) was detected in the 2005 groundwater sample collected from well CWM-183-MW13. Historically 1,1,2-TCA has also been identified at this location. The presence of 1,1,2-TCA indicates natural degradation is evident in groundwater collected from CWM-183-MW13.

Chloroethene Pathway: PCE (1.2 µg/L), TCE (120 µg/L), cis-1,2-DCE (2.5 µg/L), and trans-1,2-DCE (0.73 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW13. Historically PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCE have been detected at CWM-183-MW13. The presence of these chlorinated ethenes indicates anaerobic degradation is evident in groundwater collected from this location.

Chloromethane Pathway: Chloroform (0.7 µg/L) was detected in groundwater collected from well CWM-183-MW13 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW13.

Monitoring Well CWM-183-MW14
Residuum well CWM-183-MW14, located near the South Branch of Cane Creek, was within the EV-modeled 1,1,2,2-PCA and TCE.

Chloroethane Pathway: No chlorinated ethanes were detected in groundwater collected from CWM-183-MW14 in 2005. Historically 1,1,2,2-PCA was detected in groundwater collected in 2003.

Chloroethene Pathway: TCE (21 µg/L) and cis-1,2-DCE (0.45 µg/L) were detected in the 2005 groundwater sample collected from well CWM-183-MW14. Historically PCE, TCE, and cis-1,2-DCE have been detected at CWM-183-MW14. The presence of these chlorinated ethenes indicates anaerobic degradation is evident in groundwater collected from this location.

Chloromethane Pathway: Chloroform (0.7 µg/L) was detected in groundwater collected from well CWM-183-MW14 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW14.

Monitoring Well CWM-183-MW21
Residuum well CWM-183-MW21, located near the trenches, was within the EV-modeled 1,1,2,2-PCA, 1,1,2-TCA, cis-1,2-DCE, PCE, TCE, and vinyl chloride plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (2.9 µg/L) and 1,1,2-TCA (1.6 µg/L) were detected in the 2005 groundwater sample collected from well CWM-183-MW21. The presence of 1,1,2-TCA indicates natural degradation is evident in groundwater collected from this location.

Chloroethene Pathway: PCE (3.3 µg/L), TCE (430 µg/L), cis-1,2-DCE (40 µg/L), trans-1,2-DCE (4.3 µg/L), and 1,1-DCE (1.1 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW21. Historically PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride have been detected at CWM-183-MW21. The presence of these chlorinated ethenes indicates anaerobic degradation is occurring in groundwater collected from this location.

Chloromethane Pathway: Chloroform (0.55 µg/L) was detected in groundwater collected from well CWM-183-MW21 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW21.

Monitoring Well CWM-183-MW22
Bedrock well CWM-183-MW22, located near the trenches, was within the EV-modeled 1,1,2,2-PCA, 1,1,2-TCA, cis-1,2-DCE, PCE, TCE, and vinyl chloride plume boundaries.

Chloroethane Pathway: No chlorinated ethanes were detected in the 2005 groundwater sample collected from well CWM-183-MW22. Historically 1,1,2,2-PCA and 1,1,2-TCA have been detected in groundwater collected from this location. The presence of 1,1,2-TCA indicates natural degradation is evident in groundwater collected from this location.

Chloroethene Pathway: PCE (1.2 µg/L), TCE (170 µg/L), cis-1,2-DCE (35 µg/L), trans-1,2-DCE (4.1 µg/L), and 1,1-DCE (0.6 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW22. Historically PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride have been detected at CWM-183-MW22. The presence of these chlorinated ethenes indicates anaerobic degradation is occurring in groundwater collected from this location.

Chloromethane Pathway: No chlorinated methanes were detected in groundwater collected from well CWM-183-MW22 in 2005. Chloroform (0.75 µg/L) was detected at this location in 2003.

Monitoring Well CWM-183-MW23
Residuum well CWM-183-MW23, located at the concrete pads, was within the EV-modeled 1,1,2,2-PCA, chloroform, cis-1,2-DCE, PCE, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (12,000 µg/L) and 1,1,2-TCA (6.7 µg/L) were detected in the 2005 groundwater sample collected from well CWM-183-MW23. The presence of 1,1,2-TCA indicates natural degradation is evident in groundwater collected from this location.

Chloroethene Pathway: PCE (110 µg/L), TCE (3,600 µg/L), cis-1,2-DCE (49 µg/L), trans-1,2-DCE (3.9 µg/L), and 1,1-DCE (0.42 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW23. The presence of these chlorinated ethenes indicates anaerobic degradation is occurring in groundwater collected from this location.

Chloromethane Pathway: Chloroform (22 µg/L) was detected in groundwater collected from well CWM-183-MW23 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW23.

Monitoring Well CWM-183-MW27
Bedrock well CWM-183-MW27, located near South Branch of Cane Creek, was within the EV-modeled 1,1,2,2-PCA, PCE, and TCE, plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (0.46 µg/L) was detected in the 2005 groundwater sample collected from well CWM-183-MW27. No other chlorinated ethanes have historically been detected. At this time there is no evidence of anaerobic degradation of chloroethanes occurring at CWM-183-MW27.

Chloroethene Pathway: PCE (1.3 µg/L), TCE (88 µg/L), and cis-1,2-DCE (2.3 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW27. Historically PCE, TCE, cis-1,2-DCE, and 1,1-DCE have been detected at CWM-183-MW27. The presence of these chlorinated ethenes indicates anaerobic degradation is evident in groundwater collected from this location.

Chloromethane Pathway: Chloroform (0.8 µg/L) was detected in groundwater collected from well CWM-183-MW27 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW27.

Monitoring Well CWM-183-MW28
Bedrock well CWM-183-MW28, located downgradient from the trenches, was situated below any of the EV-modeled plume boundaries.

Chloroethane Pathway: No chlorinated ethanes were detected at this location.

Chloroethene Pathway: A trace amount of TCE (0.28 µg/L) was detected in the 2005 groundwater sample collected from CWM-183-MW28. No other chlorinated ethenes were detected.

Chloromethane Pathway: Chloroform (0.39 µg/L) was detected in groundwater collected from well CWM-183-MW28 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW28.

Monitoring Well CWM-183-MW29
Bedrock well CWM-183-MW29, located southeast from the concrete pads, was within the EV-modeled 1,1,2,2-PCA, PCE, and TCE plume boundaries.

Chloroethane Pathway: 1,1,2,2-PCA (10 µg/L) was detected in the 2005 groundwater sample collected from well CWM-183-MW29. No other chlorinated ethanes have historically been detected. At this time there is no evidence of anaerobic degradation of chloroethanes occurring at CWM-183-MW29.

Chloroethene Pathway: PCE (0.71 µg/L), TCE (61 µg/L), and cis-1,2-DCE (1.5 µg/L) were detected in the 2005 groundwater sample collected from CWM-183-MW29. Historically PCE, TCE, cis-1,2-DCE, and 1,1-DCE have been detected at CWM-183-MW29. The presence of these chlorinated ethenes indicates anaerobic degradation is evident in groundwater collected from this location.

Chloromethane Pathway: Chloroform (1.9 µg/L) was detected in groundwater collected from well CWM-183-MW27 in 2005. No other chlorinated methanes were detected. At this time no degradation of chloroform is evident in groundwater collected from CWM-183-MW29.

6.2 Fate and Transport in Surface Water

Contaminants in surface water are generally transported by overland flow, transfer to groundwater, and/or transfer to sediment. The methods of transport in surface water at the Site are described as follows:

- **Overland Flow:** Overland flow generally follows local surface topography through tracts and tributaries, sometimes draining into main surface water features such as a lake or a creek. Once contaminants reach a surface water feature, they are generally diluted and follow the fluid dynamics of the surface water feature. The main surface water feature at the Site is South Branch of Cane Creek, which flows toward the north-northwest. Site-wide contaminants include VOCs and metals, each of which interacts with surface water through different mechanisms.

  VOCs are highly volatile, and a majority of VOCs present in surface water are volatilized in the surrounding air, thus limiting transport distribution in surface water. The VOCs that are not volatilized generally demonstrate moderate aqueous solubility and tend to follow the flow of water. Two VOCs, 1,1,2,2-PCA and vinyl chloride, exceeded the SSSLs in samples collected from South Branch of Cane Creek within the boundary of the Cane Creek Training Area. No contaminants were identified in sample locations outside of the Cane Creek Training Area, indicating there were no off site overland surface water contaminant transport.

  Metals generally tend to adsorb to sediment and soils rather than remain in solution, thus limiting transport distribution in surface water. No metal contaminants were identified in surface water samples collected from South Branch of Cane creek during the 2004/2005 RFI.

- **Surface Water/Groundwater Interaction:** The surface water-to-groundwater interaction mechanism allows soluble concentrations of contaminants to transfer between

surface water and groundwater in a soluble state, depending on the fluid dynamics between the two. Contamination in surface water at the Site, specifically contamination identified in South Branch of Cane Creek may be a result of the surface water/groundwater interaction. As described in Section 2.4.2, South Branch of Cane Creek is both a gaining stream and a losing stream depending on the time of year, the amount of precipitation in the area, and the local geology.

- **Transfer to Sediment:** Contaminant transfer between surface water and sediment potentially represents a significant transfer mechanism, especially when contaminants are in the form of suspended solids. The interaction between surface water and sediments is reversible with sediments often acting as concentration reservoirs for contaminants that are gradually released into the surface water and surface water acting as a transport mechanism for contaminants that are constantly being sorbed to the sediments. VOCs and SVOCs were identified in sediment samples collected from South Branch of Cane Creek during the 2004/2005 RFI, which may indicate contaminant transport between surface water and sediment at the Site.

6.3 Fate and Transport in Sediment

Sediments often act as a concentration reservoir for contaminants sorbed from surface water. Contaminants are gradually diffused back into the surface water due to a concentration gradient and according to chemical specific distribution chemistry. These compounds then may be re-adsorbed to sediments further downstream, creating a new concentration reservoir. VOCs and SVOCs were identified in sediment samples collected from South Branch of Cane Creek during the 2004/2005 RFI.

6.4 Fate and Transport in Soi1

Contaminants in soil are generally transported through volatilization, dust emissions, erosion and surface runoff, and infiltration from surface soil to subsurface soil to groundwater. The methods of transport in soil at the Site are described as follows:

- **Volatilization:** VOC constituents in surface soil (0 to 1 feet) have a high potential to volatilize to the atmosphere and be transported from the source area via air movement. Metals and SVOCs in the surface soil are not expected to volatilize to any great extent, with the exception of mercury. Mercury exceeded the ESV at one surface soil location at the Site. Mercury did not exceed the SSSL in surface soil at the Site. Because VOC concentrations exceeded ESVs in surface soils at the Site, transport by volatilization into the atmosphere is a probable route of contaminant migration at the Site.

- **Dust Emissions:** Most metals and SVOCs in the surface soil are generally closely associated with particulate matter and could be transported from their source areas by fugitive dust generation and entrainment by the wind. Because metal concentrations exceeded the SSSLs or ESVs in surface soil sample locations at the Site, transport via dust emissions is a probable route of contaminant migration at the Site.

- **Erosion and Surface Runoff:** Surface runoff via rainwater has the potential to transport contaminants either in a dissolved state or adsorbed to soil particulates or organic matter. Surface soil contaminants may be solubilized by rainwater and subsequently transported to drainage ditches, low-lying areas, and nearby surface water bodies via surface runoff. The solubility of inorganics (metals) in rainwater is largely dependent upon the pH of the rainwater. Because the rainwater in this region is most likely slightly acidic, the metal constituents in surface soil are likely to solubilize to a small degree in the rainwater and be subject to minimal transport via runoff. Because metal COPCs were identified in surface soil sample locations at the Site, transport via surface runoff is a probable route of contaminant migration at the Site.

- **Infiltration from Surface Soil to Subsurface Soil to Groundwater:** Contaminants in surface soil may be transported vertically to subsurface soils and groundwater via solubilization in rainwater and infiltration. Migration in this manner is dependent upon soil adsorption capacity, contaminant solubility, precipitation frequency, and infiltration rates. SVOCs found at the Site are not likely to migrate to any great extent vertically due to their relatively low solubilities. Metals in soil at the Site may migrate vertically due to the slightly acidic nature of the rainwater in this area and the slightly increased solubility of metals that it produces. VOCs identified in the surface and subsurface soils at the Site, indicate transport from surface soil to subsurface soil to groundwater is a probable route of contaminant migration.

7.0 STREAMLINED HUMAN HEALTH RISK ASSESSMENT

This section discusses the streamlined human health risk assessment at the Site based on the VOC results for groundwater, surface water, and sediment samples, and the metal results for groundwater and surface and depositional soil samples collected during the 2004/2005 RFI. During the 2001 SI and 2003 RI for Training Area T-6, and the 2003 SI for Cane Creek Training Area, Shaw (Shaw, 2004) identified the VOC, SVOC, CWM product, and metals results that exceeded SSSLs; however, no further assessment was made concerning human health risk. To provide a complete assessment of human health risk at the Site, the historical results for groundwater, surface water, sediment, surface soil, and subsurface soil samples collected during the SI and RI for Training Area T-6, and the SI for Cane Creek Training Area were included in this assessment. In cases where a groundwater well location was sampled during multiple investigations, the most recent data were used in the assessment.

The streamlined human health risk assessment at the Site consisted of the following steps, which are discussed in the following sections.

- Identify exposure routes.
- Select the COPCs.
- Identify the exposure point concentrations (EPCs) for the COPCs.
- Identify the constituents of concern (COCs).
- Calculate the incremental lifetime cancer risk (ILCR) and non-cancer hazard index (HI) using the appropriate SSSL and identify the total cancer risk and total non-cancer hazard index.

7.1 Exposure Routes

Human receptors may come into contact with the chemicals in groundwater, surface water, sediment, and soil. Chemicals in soil may leach to groundwater at the Site. Chemicals in surface soil may enter surface water and sediment via runoff and erosion, eventually migrating downgradient through various drainage features. Chemicals in surface soil may also volatilize into the air, enter the air in the form of dust, or accumulate in vegetation eaten by game animals. Contaminants may enter the human food chain when game animals are hunted and the meat consumed.

The human receptor exposure route scenarios for potential human exposure to environmental media at the Site, based on the proposed future land use of Training Area T-6 (educational campus) and Cane Creek Training Area (passive recreation, part of the McClellan Park System), are shown in Table 7-1.

7.2 Constituents of Potential Concern

SSSLs were developed by IT as part of the human health risk assessment associated with site investigations being performed under the BRAC Environmental Restoration Program at McClellan (IT, 2000). On behalf of the JPA, MES revised the SSSLs using updated toxicological properties provided in the *ARBCA* (ADEM, 2006) and the protocols outlined in the

Human Health and Ecological Screening Values and PAH Background Summary Report (IT, 2000). The SSSLs are medium-specific and receptor-specific, risk-based screening concentrations that are used to quickly and efficiently screen the site for potential cancer risk and non-cancer hazards from residual chemicals in the environmental media. The SSSLs address significant exposure pathways and are sufficiently site-specific with regard to exposure assumptions that they are used to estimate risk with as much precision as a typical baseline risk assessment.

COPCs are selected by comparing the site-related chemical concentrations to their respective SSSLs, as described in previous sections of this report. The process of identifying the COPCs affecting human health at the Site is discussed in the following subsections.

7.2.1 VOCs

Detected VOCs, considered to be contaminants at the Site, were compared to their respective SSSLs (see Section 5.6). The VOC contaminants that exceeded the SSSLs were considered COPCs at the Site. See Sections 5.6.1.1, 5.6.2.1, 5.6.3.1, 5.6.4.1, and 5.6.5.1 for details concerning the assessment of VOC COPCs for groundwater, surface water, sediment, surface and depositional soil, and subsurface soil, respectively. Table 7-2 presents a summary of the VOC COPCs that exceeded the human health SSSLs for groundwater, surface water, and subsurface soil at the Site. No VOCs exceeded the human health SSSLs in sediment or surface and depositional soil at the Site.

7.2.2 SVOCs and CWM Breakdown Products

Detected PAHs with concentrations above the background (IT, 2000) are considered to be contaminants at the Site. Detected non-PAH SVOCs and CWM breakdown products are also considered to be contaminants at the Site. The SVOCs and CWM breakdown products contaminants were compared to their respective SSSLs (see Section 5.6). The SVOC and CWM breakdown product contaminants that exceeded SSSLs were considered COPCs at the Site. See Sections 5.6.1.2, 5.6.2.2, 5.6.3.2, 5.6.4.2, and 5.6.5.2 for details concerning the assessment of SVOC and CWM breakdown product COPCs for groundwater, surface water, sediment, surface and depositional soil, and subsurface soil, respectively. SVOCs and CWM breakdown products were either not detected or were less than the human health SSSLs in groundwater, surface water, sediment, surface and depositional soil, and subsurface soil at the Site.

7.2.3 Metals

Detected metal concentrations were subjected to a multi-tiered statistical evaluation, described in Section 5.6 and Appendix E, to evaluate whether metals detected in site samples were the result of site-related activities or were indicative of naturally occurring conditions. Metal results that failed all three tiers were considered contaminants at the Site. The metals contaminants were then compared to the SSSLs. The metal contaminants that exceeded the residential, construction worker, groundskeeper, or recreational SSSLs were considered COPCs at the Site. See Sections 5.6.1.3, 5.6.2.3, 5.6.3.3, 5.6.4.3, and 5.6.5.3 for details concerning the assessment of metal COPCs for groundwater, surface water, sediment, surface and depositional soil, and subsurface

soil, respectively. Table 7-2 presents a summary of the metal COPCs that failed the multi-tiered statistical evaluation and exceeded the human health SSSLs for groundwater and surface and depositional soil. Metals were either not considered contaminants or were below SSSLs in surface water, sediment, and subsurface soil at the Site.

7.3 Exposure Point Concentrations

Exposure point concentrations (EPCs), based on a statistical derivation of measured data, represent the chemical concentrations in environmental media that may come in contact with a receptor. The EPC is a representative concentration value that reflects a conservative estimate of average over the Site represented by the entire data set. For surface water, sediment, and soil, EPCs for the COPCs were selected based on the lesser of the 95 percent upper confidence limit (95% UCL), which is an estimate of the concentration of each COPC averaged over the entire site, or the maximum detected concentration (MDC) for each COPC. The 95% UCL was calculated for data sets having five or more values. For data sets having fewer than five values, the MDC was used as the EPC. In data sets with nondetect results, the method detection limit (MDL) was used as a surrogate concentration for the nondetect results. Because the MDL is the lowest concentration reported for a constituent in a given sample matrix, using the MDL for nondetect results ensures that there will be no detected concentrations with values less than nondetect concentrations in a given data set. As recommended in the ARBCA, for groundwater COPCs the MDC of the most recent data set (i.e., the most recent data for each groundwater monitoring well location at the Site) was selected as the EPC.

EPCs were selected for each COPC identified in Section 7.2. The 95% UCLs for the COPCs were calculated using ProUCL®. ProUCL® was developed on behalf of the EPA to calculate 95% UCLs following EPA Guidance, and to accommodate parametric and nonparametric data sets (EPA, 2004). The EPC for each COPC was compared to the cancer and non-cancer SSSLs for each receptor (resident, groundskeeper, construction worker, and recreational) as part of the risk analysis.

Tables 7-3, 7-4, and 7-5 present the selected EPCs and the comparison of the EPCs to cancer and non-cancer SSSLs for the COPCs in groundwater, surface water, and soil at the Site. No sediment contaminants exceeded the human health SSSLs at the Site (Table 5-13), therefore, no further evaluation of sediment contaminants was warranted.

7.4 Constituents of Concern

Based on the proposed future land use for the Site, the constituents that were considered cancer risks or non-cancer hazards for the resident in groundwater, surface and depositional soil, and subsurface soil, and the recreational user in surface water, were considered COCs. No constituents in sediment exceeded the human health SSSLs, and therefore, no COCs were identified in sediment at the Site.

As shown in Table 7-3, the cancer-based COCs for the resident in groundwater were identified as 1,1,1,2-PCA, 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, bromodichloromethane, PCE, TCE, and vinyl chloride. Non-cancer COCs for the resident in groundwater were identified as 1,1,2,2-PCA,

1,1,2-TCA, acetone, chloroform, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, nickel and thallium.

As shown in Table 7-4, only vinyl chloride was identified as the cancer-based COC for the recreational user exposed to surface water. No constituents were considered non-cancer hazards for the recreational user exposed to surface water at the Site.

As shown in Table 7-5, no constituents were considered cancer risks for the resident in surface and depositional soil at the Site. Antimony was identified as a non-cancer COC for the resident in surface and depositional soil.

As shown in Table 7-5, 1,1,2,2-PCA was identified as a cancer-based COC for the resident and groundskeeper in subsurface soil. However, because 1,1,2,2-PCA was detected in subsurface soil samples at depths of 10 feet or greater, there is no complete exposure pathway for the resident and groundskeeper and subsurface soil. Therefore, 1,1,2,2-PCA in subsurface soil is not considered an increased cancer-based risk to the resident or groundskeeper. No constituents were considered non-cancer hazards for the receptor exposed to subsurface soil.

Table 7-6 presents a summary of the COCs identified at the Site.

7.5 Cancer Risk and Non-Cancer Hazard

The EPCs were used to calculate the ILCR and non-cancer HI for the COCs identified in Section 7.4 in each environmental medium. The ILCR and HI are ratios of concentration to risk. The ILCRs and HIs for the individual COCs were summed to yield a total ILCR and total HI for the receptor exposed to each environmental medium. Based on the proposed future land use for the Site, total ILCRs and total HIs were calculated for the resident for groundwater, surface and depositional soil, and subsurface soil, and the recreational user for surface water.

7.5.1 Incremental Lifetime Cancer Risk

The acceptable ILCR for individual COCs is 1E-06. For chemicals with carcinogenic effects, if the total ILCR (i.e., the sum of the ILCRs for each COC for all exposure pathways that exist within a medium) for the receptor exceeds the target risk of 1E-05, risk management and/or remediation may be necessary (ARBCA, 2006).

Table 7-7 presents the ILCRs for residents exposed to groundwater. The total ILCR for the resident (6.16E-02) exposed to groundwater exceeded the allowable risk level of 1E-05.

Table 7-8 presents the ILCRs for recreational users exposed to surface water. The total ILCR (1.39E-05) for the recreational user exposed to surface water exceeded the allowable risk level of 1E-05.

As indicated in Table 7-5, no constituents were considered cancer risks for residents exposed to surface and depositional soil at the Site.

7.5.2 Non-Cancer Hazard Index

The acceptable HI for individual COCs for non-carcinogens is 0.1. The acceptable total HI (i.e., the sum of the individual COC HIs) for a receptor is less than or equal to 1.0. Total HIs for a receptor above 1.0 raises concern for potential non-cancer effects (ARBCA, 2006 and EPA, 2001).

Table 7-7 presents the HIs for residents exposed to groundwater. The total HI for the resident (89) exposed to groundwater exceeded the limit of 1.0 and raises concern for potential non-cancer effects.

As indicated in Table 7-4, no constituents were considered non-cancer hazards for recreational users exposed to surface water.

Table 7-9 presents the HIs for residents exposed to surface and depositional soil. The total HI (0.18) for the resident was below the limit of 1.0, therefore, no constituents were considered non-cancer hazards for the resident exposed to surface and depositional soil.

As indicated in Table 7-5, no constituents were considered non-cancer hazards for residents exposed to subsurface soil.

Table 7-10 presents the total non-cancer hazard effects by target organ for groundwater. The total HIs for liver (86), kidney (68), erythrocyte (1.16), central nervous system (CNS) (5.66), skin (4.91), and nasal epithelium (7.1) for the resident exposed to groundwater exceeded 1.

Table 7-11 presents the total non-cancer hazard effects by target organ for surface and depositional soil. None of the total HIs for the receptors exposed to surface and depositional soil exceeded 1.

7.6 Uncertainty Analysis

Due to the complexity and individuality of each environmental risk assessment, a certain amount of uncertainty is common. The following includes a discussion on sources of uncertainty for this risk assessment.

- Calculation of the EPC can be a source of either an over-estimate or under-estimate of exposure depending on the representativeness of supporting data. To reduce the level of uncertainty at the Site, groundwater, surface water, sediment, surface and depositional soils, and subsurface soil samples were collected at several locations throughout the Site. Results from a total of 34 groundwater samples, 12 surface water samples, 12 sediment samples, 46 surface and depositional soil samples, and 30 subsurface soil samples were used for this risk assessment. This large number and wide array of sample locations and sample types is highly representative of the Site, thereby reducing the level of uncertainty.

- Groundwater sample results used in this assessment were collected during three separate

sampling events, one each in 2003, 2004, and 2005. To reduce the level of uncertainty, a majority of the locations sampled in 2003 were re-sampled in 2004 or 2005 and only the most recent sample results were used in this risk assessment.

- Some metals that were ascertained to be naturally occurring during the metals statistical evaluations (Appendix E) had concentrations above SSSLs, which contribute to risk and are not related to Site activities. Naturally occurring metal concentrations such as these may result in an overestimation of risk related to Site activities.

- Due to the limitations of the statistical analyses, a background analysis could not be completed for certain metals. These metals were automatically carried through to the end of the risk assessment and represent additional risk that may not be related to Site activities.

Acceptable levels of uncertainty in this risk assessment have been accomplished by mitigation of variables contributing to uncertainty. The estimation of the ILCR is based primarily on COCs and media for which there are sufficient representative data and therefore the result is also representative of risk associated with the Site. The estimation of risk associated with a non-carcinogenic threat is likely biased slightly high as a result of risk attributed by naturally occurring metals, and metals carried through the risk assessment without a completed Tier 3 analysis. Mitigation of non-carcinogenic risk beyond that which is concomitant with cancer risk is therefore not supported, however the cumulative risk estimates presented in Table 7-7 would be reduced through mitigation of the cancer risk.

7.7 Human Health Risk Assessment Conclusions

The groundwater at the Site presents an unacceptable cancer risk and an unacceptable non-cancer hazard to the resident. The surface water at the Site presents an unacceptable cancer risk to the recreational user.

The data indicated that chlorinated VOCs in groundwater, particularly 1,1,2,2-PCA and TCE, are responsible for cancer risks and non-cancer hazards exceeding acceptable levels.

The estimation of risk associated with non-carcinogenic threat is likely biased slightly high as a result of risk attributed by naturally occurring metals, and metals carried through the risk assessment without a completed Tier 3 analysis. Mitigation of non-carcinogenic risk beyond that which is concomitant with cancer risk is therefore not supported, however the cumulative risk estimates presented in Table 7-7 would be reduced through mitigation of the cancer risk.

8.0 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

In order to evaluate the potential for ecological risks posed by site-related constituents at the Site, an ecological risk assessment was conducted. This section discusses the environmental setting, exposure pathways, and ecological risk assessment performed as part of this RFI.

8.1 Environmental Setting and Terrestrial Habitat

Training Area T-6 is a heavily wooded area approximately 10 acres in size and located at the base of the northeastern slope of Howitzer Hill, west of Fox Road and South Branch of Cane Creek in the west-central area of McClellan. The area is fenced and posted, however, the site is accessible due to breaks in the fence. Cane Creek Training Area is located just northeast of Training Area T-6 and southeast of the intersection of Derby Street and Fox Road. Cane Creek Training Area is approximately two acres in size and straddles South Branch of Cane Creek.

Terrestrial habitat at the Site is mixed coniferous/deciduous forest characteristic of a typical mesophytic forest. South Branch of Cane Creek flows through Cane Creek Training Area to the north-northwest. Two drainage ditches traverse Cane Creek Training Area, one in the northern portion and one in the central portion of the parcel. Several drainage ditches traverse Training Area T-6 and discharge surface water to the east-northeast, towards South Branch of Cane Creek. Training Area T-6 and Cane Creek Training Area are not located within a SINA or wetland area (IT, 2002b).

The canopy species characteristic of this area are tulip tree *(Liriodendron tulipifera),* sweetgum *(Liquidambar styraciflua),* black gum *(Nyssa sylvatica),* shortleaf pine *(Pinus echinata),* loblolly pine *(Pinus taeda),* white oak *(Quercus alba),* and northern red oak *(Quercus rubra).* The dominant understory species of this area are red maple *(Acer rubrum),* flowering dogwood *(Cornus florida),* witch hazel *(Hamamelis virginiana),* sweetgum *(Liquidambar styraciflua),* and sourwood *(Oxydendrum arboreum).* The shrub layer is dominated by mountain laurel *(Kalmia latifolia),* southern low blueberry *(Vaccinium pallidum),* southern wild raisin *(Viburnum nudum),* and yellowroot *(Xanthorhiza simplicissima).* Numerous muscadine grape *(Vitis rotundifolia)* vines, greenbriar *(Smilax rotundifolia)* and poison ivy *(Toxicodendron radicans)* are also present in this area (IT, 2002b).

In general, the terrain at McClellan supports large numbers of amphibians and reptiles. Jacksonville State University has prepared a report titled *Amphibians and Reptiles of Fort McClellan, Calhoun County, Alabama* (Cline and Adams, 1997). The report indicated that surveys in 1997 found 16 species of toads and frogs, 12 species of salamanders, 5 species of lizards, 7 species of turtles, and 17 species of snakes. Typical inhabitants of the area are copperhead *(Agkistrodon contortix),* king snake *(Lampropeltis getulus),* black racer *(Coluber constrictor),* fence lizard *(Sceloporour undulatus),* and six-lined racerunner *(Cnemidophorous sexlineatus).*

Terrestrial species that may inhabit the vicinity of the Site, include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern

woodrat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at McClellan at least part of the year (ACOE, 1997). Common species expected to occur in the vicinity of the Site include northern cardinal *(Cardinalis cardinalis)*, northern mockingbird *(Mimus polyglottus)*, warblers *(Dendroica spp.)*, indigo bunting *(Passerina cyanea)*, red-eyed vireo *(Vireo olivaceus)*, American crow *(Corvus brachyrhynchos)*, bluejay *(Cyanocitta cristata)*, several species of woodpeckers *(Melanerpes spp., Picoices spp.)*, and Carolina chickadee *(Parus carolinensis)*. Game birds present in the vicinity of the Site may include northern bobwhite *(Colinus virginianus)*, mourning dove *(Zenaida macroura)*, and eastern wild turkey *(Meleagris gallopavo)*. A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground. Because of the presence of South Branch of Cane Creek, piscivorous bird species may also be present in the vicinity of the Site. These piscivorous birds may include great blue heron *(Ardea herodias)*, green-backed heron *(Butorides striatus)*, and belted kingfisher *(Ceryle alcyon)* (IT, 2002b).

The Gray Bat, Blue Shiner, Mohr's Barbara Buttons, and Tennessee Yellow-Eyed Grass have been listed as threatened or endangered by the USFWS and have been recorded on McClellan (IT, 2002a). The Blue Shiner, Mohr's Barbara Buttons, and Tennessee Yellow-Eyed Grass have not been observed at the Site (Garland, 1996). However, South Branch of Cane Creek, which is in the vicinity of the Site, was identified as a moderate quality gray bat foraging habitat (IT, 2002b). Two major requirements for gray bat foraging habitat are contiguous forest cover and habitat for aquatic insects (one of the gray bat's preferred dietary items). These two requirements are met by the South Branch of Cane Creek in this area.

8.2 Exposure Pathways

For exposures to occur, complete exposure pathways must exist between the contaminant and the receptor. A complete exposure pathway requires the following four components:

- A source mechanism for contaminant release.
- A transport mechanism.
- A point of environmental contact.
- A route of uptake at the exposure point.

If any of these four components are absent, then a pathway is generally considered incomplete (EPA, 1989).

While constituents in soils may leach into groundwater, environmental receptors generally will not come into direct contact with constituents in groundwater because there is no direct exposure route. Receptors could potentially be exposed to groundwater via surface water pathways if groundwater discharges to surface water bodies, including streams present at the Site.

Ecological receptors may be exposed to constituents in surface water or sediment via direct contact or through consumption of water. Aquatic organisms inhabiting contaminated waters would be in constant contact with COCs.

Chemicals present in the sediment may result from erosion or adsorption of water-borne constituents onto sediment particles. If sediments are present in an area that is periodically inundated with water, then previous exposure pathways for soils would be applicable during dry periods. At the Site, water-carrying drainage tracts exist during high precipitation events and remain dry during low periods of precipitation. Water overlying sediments prevents contaminants from either volatilizing or being carried by wind erosion. Exposure via dermal contact may occur, especially for benthic organisms and wading birds. Some aquatic organisms consume sediment and ingest organic material from the sediment. Inadvertent ingestion of sediments may also occur as the result of feeding on benthic organisms and plants.

Ecological receptors may be exposed to constituents in soils via direct and/or secondary exposure pathways. Direct exposure pathways include soil ingestion, dermal absorption, and inhalation of COCs adsorbed to fugitive dust. Significant exposure via dermal contact is limited to organic constituents, which are lipophilic and can penetrate epidermal barriers. Mammals are less susceptible to exposure via dermal contact with soils because their fur prevents skin from coming into direct contact with soil. However, soil ingestion may occur while grooming, preening, burrowing, or consuming plants, insects, or invertebrates that reside in soil.

Exposure via inhalation of fugitive dust is limited to contaminants present in surface soils at areas that are devoid of vegetation. The amount of vegetative cover, the inherent moisture content of the soil, and the frequency of soil disturbance play important roles in the amount of fugitive dust generated at a particular site. In forested areas, such as at the Site, fugitive dust generation is expected to be minimal.

Secondary exposure pathways involve constituents that are transferred through different trophic levels of the food chain and may be bioaccumulated. This may include constituents bioaccumulated from soil into plant tissues or into terrestrial species ingesting soils. These plants or animals may, in turn, be consumed by animals at higher trophic levels. Water-borne and sediment-borne COCs may bioaccumulate into aquatic organisms, aquatic plants, or animals which frequent surface waters and then be passed through the food chain to impact organisms at higher trophic levels.

8.3 Ecological Risk Assessment

The ecological risk assessment at the Site was performed based on the VOC results for surface water and sediment samples, and metal results for surface and depositional soil samples collected during the 2004/2005 RFI; and the historical VOC, SVOC, CWM product, and metal results for surface water, sediment, surface soil, and subsurface soil samples collected during the 2001 SI and 2003 RI for Training Area T-6, and the 2003 SI for Cane Creek Training Area (Shaw, 2004). The subsurface soils collected at the Site were assessed, however, subsurface soils at depths greater than 10 feet bgs are not considered to present a viable exposure pathway. Therefore, COPCs in subsurface soils with depths greater than 10 feet bgs were not considered to present an ecological risk.

The screening-level ecological risk assessment for the Site consisted of the following steps, which are discussed in the following sections.

- Select the COPCs.
- Identify the EPCs for the COPCs.
- Calculate the screening-level hazard quotients (HQs) and identify the COCs that may pose an ecological risk.
- Assess the COCs in relation to the environmental setting and habitat(s) in and around the Site.

8.4 Constituents of Potential Concern

The ESVs used in this ecological risk assessment were developed specifically for McClellan in conjunction with EPA Region IV (IT, 2000). These ESVs are conservative and are based on no-observed-adverse-effect-levels (NOAEL) when available. If a NOAEL-based ESV was not available, then the most health-protective value available from the scientific literature was identified as the ESV (IT, 2000). COPCs were selected by comparing the site-related chemicals to their respective ESVs.

8.4.1 VOCs

Detected VOCs, considered to be contaminants for the Site, were compared to their respective ESVs (Section 5.6). The VOC contaminants that exceeded the ESVs were considered COPCs at the Site. See Sections 5.6.2.1, 5.6.3.1, 5.6.4.1, and 5.6.5.1 for details concerning the assessment of VOC COPCs for surface water, sediment, surface and depositional soil, and subsurface soil, respectively. The VOC COPCs that exceeded the ESVs for surface water, sediment, surface soil, and subsurface soil at the Site are shown in Table 8-1.

8.4.2 SVOCs and CWM Breakdown Products

Detected PAHs with concentrations above the background values (IT, 2000) were considered to be contaminants at the Site. Detected non-PAH SVOCs and CWM breakdown products were considered to be contaminants for the Site. The SVOCs and CWM breakdown products contaminants were compared to their respective ESVs (see Section 5.6); contaminants that exceeded ESVs were considered COPCs at the Site. See Sections 5.6.2.2, 5.6.3.2, 5.6.4.2, and 5.6.5.2 for details concerning the assessment of SVOC and CWM breakdown product COPCs for surface water, sediment, surface and depositional soil, and subsurface soil, respectively. The SVOC COPCs that exceeded the ESVs for sediment and surface and depositional soil at the Site are shown in Table 8-1. No SVOC COPCs were identified in surface water or subsurface soil at the Site.

CWM breakdown products were not detected in the surface water, sediment, surface soil, or depositional soil samples at the Site. No CWM breakdown products exceeded the ESVs in subsurface soil at the Site.

8.4.3 Metals

Detected metal concentrations were subjected to a multi-tiered statistical evaluation, described in

Section 5.6 and Appendix E, to ascertain whether metals detected in site samples were the result of site-related activities or were indicative of naturally occurring conditions. Metal results that failed all three tiers were considered contaminants at the Site. The metals contaminants were then compared to the ESVs. The metal contaminants that exceeded ESVs were considered COPCs at the Site. See Sections 5.6.2.3, 5.6.3.3, 5.6.4.3, and 5.6.5.3 for details concerning the assessment of metal COPCs for surface water, sediment, surface and depositional soil, and subsurface soil, respectively. Table 8-1 presents a summary of the metal COPCs that that failed the multi-tiered statistical evaluation and exceeded the ESVs in surface and depositional soil at the Site. No metal contaminants were identified in surface water or sediment at the Site. No metal contaminants exceeded the ESVs in subsurface soil at the Site.

8.5 Exposure Point Concentrations

As described in Section 7.2, EPCs for each COPC were selected based on the lesser of the 95% UCL or the MDC. The 95% UCL was calculated for data sets having five or more values. For data sets having fewer than five values, the MDC was used as the EPC. EPCs were selected for each COPC identified in Section 8.4. The 95% UCLs for the COPCs were calculated using ProUCL® (EPA, 2004). Table 8-2 presents the EPCs and the comparison of the EPCs to ESVs for the COPCs in surface water, sediment, surface/depositional soil, and subsurface soil at the Site.

8.6 Screening Level Hazard Quotients and Constituents of Concern

To assess whether the COPCs detected at the Site have the potential to pose adverse ecological risks, the COPCs were evaluated against the ESVs by calculating screening-level HQs for each environmental medium. An HQ was calculated by dividing the EPC by its corresponding ESV. HQs with values of one or less indicated that the COPC is not likely to pose adverse ecological risks. COPCs with an HQ value greater than one were identified as COCs that may pose adverse ecological risks to one or more receptors. Table 8-2 presents the calculated screening-level HQs and the COCs identified as potential ecological risks for surface water, sediment, surface/depositional soil, and subsurface soil at the Site.

The following COCs were identified as potential ecological risks at the Site:

- Vinyl chloride in surface water.
- Vinyl chloride and bis(2-ethylhexyl)phthalate in sediment.
- 1,1,2,2-PCA, chloroform, TCE, hexachlorobenzene, pentachlorophenol, antimony, mercury, and zinc in surface and depositional soil.
- 1,1,2,2-PCA, chloroform, and TCE in subsurface soil.

8.7 Uncertainty Analysis

Due to the complexity and individuality of each ecological risk assessment, a certain amount of uncertainty is common. Sources of uncertainty for this risk assessment are presented below.

- Calculation of the EPC can be a source of either an over-estimate or under-estimate of exposure depending on the representativeness of supporting data. To reduce the level of

uncertainty at the Site, surface water, sediment, surface and depositional soil, and subsurface soil samples were collected at several locations throughout the Site. Results from a total of 12 surface water samples, 12 sediment samples, 46 surface and depositional soil samples, and 30 subsurface soil samples were used for this risk assessment. This large number and wide array of sample locations and sample types is highly representative of the Site, thereby reducing the level of uncertainty.

- Some metals that were ascertained to be naturally occurring during the metals statistical evaluations (Appendix E) had concentrations above ESVs, and therefore, may contribute to risk but are not related to Site activities. Naturally occurring metal concentrations such as these may contribute to an overestimation of risk related to Site activities.

- Due to the limitations of the statistical analyses, a background analysis could not be completed for certain metals. These metals were automatically carried through to the end of the risk assessment and represent additional risk that may not be related to Site activities.

- Antimony was detected in a small percentage of surface/depositional soil samples (7 out of 46) collected at the Site and several of the detected concentrations of antimony, mercury, and zinc in surface/depositional soil samples were estimated values less than the laboratory reporting limit. These sporadic and low concentrations of metals at the Site are a source for uncertainty, and may contribute to an overestimation of the ecological risks posed by these metals.

- Bis(2-ethylhexyl)phthalate was detected in only one out of 12 sediment samples collected from the Site, at a concentration less than the laboratory reporting limit. In addition, bis(2-ethylhexyl)phthalate is a common laboratory contaminant. The low concentration of this analyte at the Site and the possibility that this analyte may have come from the laboratory is a source for uncertainty, and may contribute to an overestimation of ecological risk posed by this analyte.

- Temporal variation in habitat condition and species present at the Site can be a potential source of uncertainty when inferring (a) the existence of potential (unknown) ecological receptor species, and (b) potential (unknown) exposure pathways.

Acceptable levels of uncertainty in this risk assessment have been accomplished by mitigation of variables contributing to uncertainty. The conservative approach taken for this ecological risk assessment is based primarily on COPCs and media for which there are sufficient representative data, and therefore, the result is also representative of risk associated with the Site. The estimation of ecological risk is likely biased high as a result of risk attributed by naturally occurring metals, metals carried through the risk assessment without a completed background analysis, sporadic low metal concentrations, and conservative estimates of habitat condition and species present that may or may not be representative of actual ecological Site conditions.

8.8 Conclusions

The ecological risk assessment for the Site consisted of the identification of the COPCs for each

medium at the site, identification of the EPC for each COPC, calculating HQs used to identify COCs, and assessing the COCs in relation to the environmental setting and habitat.

Vinyl chloride (HQ 2.2) was identified as a COC in surface water. Because vinyl chloride was detected in only two surface water samples and above the ESV in only one of those samples, and because of the relatively low magnitude of the HQ, vinyl chloride in surface water most likely does not pose a significant ecological risk.

Vinyl chloride (HQ 27) and bis(2-ethylhexyl)phthalate (HQ 1.4) were identified as COCs in sediment. Because bis(2-ethylhexyl)phthalate was detected in only one sediment sample, and the HQ for bis(2-ethylhexyl)phthalate was only slightly above 1, the uncertainty surrounding the data is sufficient to eliminate this compound from consideration as a COC. Vinyl chloride was detected at only two locations, one upstream just outside of the southern border of Cane Creek Training Area and one midstream within the central portion of Cane Creek Training Area. Although there were only two detects for vinyl chloride, because of the magnitude of the HQ value, vinyl chloride in sediment at the Site may pose an increased risk to ecological receptors due to Site activities.

1,1,2,2-PCA (HQ 1.1), chloroform (HQ 81), TCE (HQ 80), hexachlorobenzene (HQ 29), pentachlorophenol (HQ 62), antimony (HQ 1.6), mercury (HQ 1.6), and zinc (HQ 13) were identified as COCs in surface and depositional soil at the Site. Because the HQs for 1,1,2,2-PCA, antimony, and mercury in surface and depositional soil were only slightly above 1, the uncertainty surrounding the data is sufficient to eliminate these compounds from consideration as COCs. Because of the magnitude of their HQ values, chloroform and TCE in surface and depositional soil may pose increased risk to ecological receptors due to Site activities. The HQ values for hexachlorobenzene and pentachlorophenol in surface and depositional soil were also high, however, because they were detected at only one location, they were not considered to be wide-spread contaminants and were considered to pose insignificant risk to ecological populations at the Site. Although there were only two detects for zinc, because of the magnitude of the HQ value and because it was detected in separate locations (one of them away from the source area), zinc in surface and depositional soil at the Site may pose an increased risk to ecological receptors due to Site activities.

1,1,2,2-PCA (HQ 146), chloroform (HQ 14), and TCE (HQ 1189) were identified as COCs in subsurface soil. Although 1,1,2,2-PCA was detected at several locations at relatively deep depths (9 bgs or greater), because of the high magnitude of the HQ, 1,1,2,2-PCA in subsurface soil at the Site may pose an increased risk to ecological receptors due to Site activities. Chloroform was detected at several locations at depths of 4 bgs or greater, and TCE was detected at several locations at depths of 2.3 bgs or greater. Because they were above the ESV at relatively shallow depths and because of the high magnitude of the HQs, chloroform and TCE in subsurface soil at the Site may pose an increased risk to ecological receptors due to Site activities. PCE (HQ 2.6) was also identified as a COC in subsurface soil, however, PCE exceeded the ESV in only one subsurface soil sample location at a depth greater than 10 feet bgs, and the HQ for PCE in subsurface soil was relatively low. Therefore, PCE is not considered an ecological risk in subsurface soil at the Site.

9.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the results of the 2004/2005 RFI for the Site and presents the major conclusions and recommendations.

9.1 Conclusions

This RFI includes data collected from the 2001 and 2003 SIs, 2003 RI, and the 2004/2005 RFI and encompasses groundwater, surface water, sediments, surface and depositional soils, and subsurface soils at the Site and discusses the affect of training and decontamination activities related to human health and the environment.

VOC, SVOC, and metal contamination were identified in groundwater, surface water, sediment, surface and depositional soil, or subsurface soil at the Site. However, based on the estimated extent of the groundwater plume and nature of the contaminant, 1,1,2,2-PCA and TCE are considered to be the driving factor for remediation or risk management decisions.

A risk assessment was performed using data collected during these investigations, and the risk to human health and ecological receptors was identified based on proposed future land use.

Cancer-based human health COCs for the resident were identified as 1,1,1,2-PCA, 1,1,2,2-PCA, 1,1,2-TCA, 1,2-DCA, bromodichloromethane, PCE, TCE, and vinyl chloride in groundwater. Vinyl chloride was identified as the cancer-based human health COC in surface water for the recreational user. No cancer-based human health COCs were identified for sediment. The estimation of the ILCR is based primarily on COCs and media for which there are sufficient representative data and therefore the result is also representative of risk associated with the Site.

Non-cancer human health COCs for the resident were identified as 1,1,2,2-PCA, 1,1,2-TCA, acetone, chloroform, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, nickel and thallium in groundwater; and antimony in surface and depositional soil. No non-cancer-based human health COCs were identified in surface water or sediment for the recreational user. The estimation of risk associated with non-carcinogenic threat is likely biased slightly high as a result of risk attributed by naturally occurring metals, and metals carried through the risk assessment without a completed background analysis. Mitigation of non-carcinogenic risk beyond that which is concomitant with cancer risk is therefore not supported, however the cumulative risk estimates shown in Tables 7-6 to 7-8 would be substantially reduced through mitigation of the cancer risk.

An ecological risk assessment was conducted to evaluate the potential for ecological risks posed by site-related constituents at the Site. Vinyl chloride was identified as an ecological COC in sediment; chloroform, TCE, and zinc were identified as COCs in surface and depositional soil; 1,1,2,2-PCA, chloroform, and TCE were identified as COCs in subsurface soil. These constituents may pose an increased risk to ecological receptors due to Site activities.

9.2 Recommendations

The following recommendations are based on a thorough understanding of the data collected

during this RFI, the risk assessment performed, and the proposed future land use for the Site.

- No further actions with respect to environmental data collection are required to adequately define the nature and extent of contamination at the Site.

- Groundwater and surface water contamination present risk to human health and the environment at levels sufficient to warrant a combination of remediation and risk management decisions.

- The findings of this RFI indicate that hazardous constituents have been found in concentrations exceeding those appropriate for the protection of human health and the environment. Therefore, in accordance with Section III.E. of the CA, a Corrective Measures Implementation Plan (CMIP) will be submitted to ADEM within 180 calendar days of the submittal of this RFI. The CMIP will include a proposed final remedy, procedures necessary to implement and monitor the remedy, and applicable land use controls. Remedies to be considered may include:

    - No action
    - Monitored natural attenuation
    - In-situ chemical remediation
    - Enhanced in-situ bioremediation
    - Reactive permeable barrier
    - Groundwater extraction and treatment

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TABLES

Table 2-1: Groundwater Elevations, 2003 RI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Measurement Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
April 2003						
CC-510-MW01	residuum	4/17/2003	782.35	784.46	7.26	777.20
CC-510-MW02	residuum	4/17/2003	783.18	785.5	6.25	779.25
CC-510-MW03	residuum	4/17/2003	783.32	785.74	7.23	778.51
CC-510-MW04	residuum	4/17/2003	787.36	789.6	9.19	780.41
CWM-183-MW01	residuum	4/17/2003	853.77	855.91	17.36	838.55
CWM-183-MW02	residuum	4/17/2003	827.94	829.79	6.21	823.58
CWM-183-MW03	residuum	4/17/2003	788.81	790.81	8.78	782.03
CWM-183-MW04	residuum	4/17/2003	798.34	800.51	17.98	782.53
CWM-183-MW05	residuum	4/17/2003	796.48	798.55	12.85	785.70
CWM-183-MW06	residuum	4/17/2003	808.91	810.92	23.56	787.36
CWM-183-MW07	residuum	4/17/2003	798.83	800.93	16.19	784.74
CWM-183-MW08	residuum	4/17/2003	796.74	798.76	15.20	783.56
CWM-183-MW09	residuum	4/17/2003	806.95	809.18	24.59	784.59
CWM-183-MW10	residuum	4/17/2003	799.96	802.01	18.88	783.13
CWM-183-MW12	residuum	4/17/2003	813.03	815.36	31.90	783.46
CWM-183-MW14	residuum	4/17/2003	792.11	794.43	12.81	781.62
CWM-183-MW15	residuum	4/17/2003	790.82	793.21	11.41	781.80
CWM-183-MW18	residuum	4/17/2003	787.08	786.93	3.76	783.17
CWM-183-MW21	residuum	4/17/2003	811.70	813.92	27.47	786.45
CWM-183-MW23	residuum	4/17/2003	819.93	822.28	32.00	790.28
CWM-183-MW24	residuum	4/17/2003	804.89	807.23	19.67	787.56
CWM-183-MW11	bedrock	4/17/2003	807.07	809.25	27.32	781.93
CWM-183-MW13	bedrock	4/17/2003	799.60	801.81	20.01	781.80
CWM-183-MW16	bedrock	4/17/2003	790.88	793.13	11.40	781.73
CWM-183-MW17	bedrock	4/17/2003	788.60	790.78	9.58	781.20
CWM-183-MW19	bedrock	4/17/2003	787.17	787.06	6.15	780.91
CWM-183-MW20	bedrock	4/17/2003	796.41	798.81	16.87	781.94
CWM-183-MW22	bedrock	4/17/2003	812.28	814.59	28.24	786.35
June 2003						
CC-510-MW01	residuum	6/23/2003	782.35	784.46	7.28	777.18
CC-510-MW02	residuum	6/23/2003	783.18	785.50	6.15	779.35
CC-510-MW03	residuum	6/23/2003	783.32	785.74	7.20	778.54
CC-510-MW04	residuum	6/23/2003	787.36	789.60	9.08	780.52
CWM-183-MW01	residuum	6/23/2003	853.77	855.91	19.39	836.52
CWM-183-MW02	residuum	6/23/2003	827.94	829.79	7.09	822.70
CWM-183-MW03	residuum	6/23/2003	788.81	790.81	7.89	782.92
CWM-183-MW04	residuum	6/23/2003	798.34	800.51	17.63	782.88
CWM-183-MW05	residuum	6/23/2003	796.48	798.55	12.83	785.72
CWM-183-MW06	residuum	6/23/2003	808.91	810.92	24.65	786.27
CWM-183-MW07	residuum	6/23/2003	798.83	800.93	14.86	786.07
CWM-183-MW08	residuum	6/23/2003	796.74	798.76	14.96	783.80
CWM-183-MW09	residuum	6/23/2003	806.95	809.18	24.36	784.82
CWM-183-MW10	residuum	6/23/2003	799.96	802.01	18.97	783.04
CWM-183-MW12	residuum	6/23/2003	813.03	815.36	31.96	783.40
CWM-183-MW14	residuum	6/23/2003	792.11	794.43	12.62	781.81
CWM-183-MW15	residuum	6/23/2003	790.82	793.21	11.19	782.02

Table 2-1: Groundwater Elevations, 2003 RI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Measurement Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
CWM-183-MW18	residuum	6/23/2003	787.08	786.93	3.18	783.75
CWM-183-MW21	residuum	6/23/2003	811.70	813.92	27.19	786.73
CWM-183-MW23	residuum	6/23/2003	819.93	822.28	32.02	790.26
CWM-183-MW24	residuum	6/23/2003	804.89	807.23	18.91	788.32
CWM-183-MW11	bedrock	6/23/2003	807.07	809.25	27.13	782.12
CWM-183-MW13	bedrock	6/23/2003	799.60	801.81	19.82	781.99
CWM-183-MW16	bedrock	6/23/2003	790.88	793.13	11.18	781.95
CWM-183-MW17	bedrock	6/23/2003	788.60	790.78	9.32	781.46
CWM-183-MW19	bedrock	6/23/2003	787.17	787.06	5.85	781.21
CWM-183-MW20	bedrock	6/23/2003	796.41	798.81	16.67	782.14
CWM-183-MW22	bedrock	6/23/2003	812.28	814.59	27.97	786.62

Notes:
BTOC = Below top of casing

Source: Shaw, 2004

Table 2-2: Horizontal Hydraulic Gradients, 2003 RI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area Parcel, 510(7)
McClellan, Anniston, Alabama

Upgradient Monitoring Well	Measurement Date	Groundwater Elevation	Downgradient Monitoring Well	Groundwater Elevation	Horizontal Distance	Elevation Difference (feet)	Horizontal Gradient (ft/ft)
Residuum							
CWM-183-MW01	4/17/2003	838.55	CWM-183-MW12	783.46	284	55.09	0.194
CWM-183-MW12	4/17/2003	783.46	CC-510-MW04	780.41	506	3.05	0.006
CWM-183-MW23	4/17/2003	790.28	CC-510-MW04	780.41	450	9.87	0.022
CWM-183-MW01	6/23/2003	836.52	CWM-183-MW12	783.40	284	53.12	0.187
CWM-183-MW12	6/23/2003	783.40	CC-510-MW04	780.52	506	2.88	0.006
CWM-183-MW23	6/23/2003	790.26	CC-510-MW04	780.52	450	9.74	0.022
Bedrock							
CWM-183-MW22	4/17/2003	786.35	CWM-183-MW17	781.20	375	5.15	0.014
CWM-183-MW22	6/23/2003	786.62	CWM-183-MW17	781.46	375	5.16	0.014

Notes:
Elevations in feet above mean sea level.
ft/ft = feet per foot

Source of Groundwater Elevation Data: Shaw, 2004
Horizontal gradients were calculated by MES using data collected by Shaw in 2003.

Table 2-3: Vertical Hydraulic Gradients, 2003 RI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area Parcel, 510(7)
McClellan, Anniston, Alabama

Well Cluster IDs	Well Completion Zone	Midpoint of Screen (elevation)	Groundwater Elevation (Apr 03)	Groundwater Elevation (Jun 03)	dH (Apr 03)	dH (Jun 03)	dL	Vertical Hydraulic Gradient (ft/ft) (Apr 03)	Vertical Hydraulic Gradient (ft/ft) (Jun 03)
CWM-183-MW06	residuum	786.41	787.36	786.27	5.43	4.15	69.34	0.078	0.060
CWM-183-MW11	bedrock	717.07	781.93	782.12					
CWM-183-MW15	residuum	772.82	781.80	782.02	0.07	0.07	60.94	0.001	0.001
CWM-183-MW16	bedrock	711.88	781.73	781.95					
CWM-183-MW18	residuum	774.58	783.17	783.75	2.26	2.54	77.41	0.029	0.033
CWM-183-MW19	bedrock	697.17	780.91	781.21					
CWM-183-MW08	residuum	783.74	783.56	783.80	1.62	1.66	58.33	0.028	0.028
CWM-183-MW20	bedrock	725.41	781.94	782.14					
CWM-183-MW21	residuum	780.2	786.45	786.73	0.1	0.11	25.92	0.004	0.004
CWM-183-MW22	bedrock	754.28	786.35	786.62					
CWM-183-MW04	residuum	781.34	782.53	782.88	0.73	0.89	30.24	0.024	0.029
CWM-183-MW13	bedrock	751.1	781.80	781.99					
CWM-183-MW03	residuum	777.31	782.03	782.92	0.83	1.46	31.71	0.026	0.046
CWM-183-MW17	bedrock	745.6	781.20	781.46					
CC-510-SW/SD03	surface water	778.3	778.3	--	-4.87	--	3.72	-1.309	--
CWM-183-MW18	residuum	774.58	783.17	--					
CC-510-SW/SD03	surface water	778.3	778.3	--	-0.21	--	1.0	-0.214	--
CC-510-MW03	residuum	777.32	778.51	--					

Notes:

Elevations in feet above mean sea level.
ft bgs = feet below ground surface
dH = Difference in groundwater elevation (feet)
dL = Difference in midscreen elevation (feet)

ft/ft = feet per foot (a negative value indicates an upward vertical gradient)
-- = Surface water survey data not collected in June 2003.

Source of Groundwater Elevation Data: Shaw, 2004
Vertical gradients were calculated by MES using data collected by Shaw in 2003.

Table 4-1: Sample Designations and Analytical Parameters, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Sample Identification	Well Type	Sample Date	Analytical Parameters
Groundwater Samples			
CC-510-MW01	residuum	5/27/04	VOCs
CC-510-MW01	residuum	9/29/05	VOCs, Metals
CC-510-MW02	residuum	5/27/04	VOCs
CC-510-MW02	residuum	10/7/05	VOCs
CC-510-MW03	residuum	5/28/04	VOCs
CC-510-MW03	residuum	10/5/05	VOCs
CC-510-MW04	residuum	5/25/04	VOCs
CC-510-MW04	residuum	9/29/05	VOCs
CWM-183-MW03	residuum	5/25/04	VOCs
CWM-183-MW04	residuum	5/28/04	VOCs
CWM-183-MW04	residuum	10/10/05	VOCs
CWM-183-MW06	residuum	10/10/05	VOCs
CWM-183-MW09	residuum	5/27/04	VOCs
CWM-183-MW10	residuum	5/27/04	VOCs
CWM-183-MW10	residuum	10/4/05	VOCs
CWM-183-MW11	bedrock	10/10/05	VOCs
CWM-183-MW12	residuum	5/27/04	VOCs
CWM-183-MW12	residuum	10/5/05	VOCs
CWM-183-MW13	bedrock	5/27/04	VOCs
CWM-183-MW13	bedrock	10/10/05	VOCs
CWM-183-MW14	residuum	5/27/04	VOCs
CWM-183-MW14	residuum	10/4/05	VOCs
CWM-183-MW16	bedrock	5/27/04	VOCs
CWM-183-MW17	bedrock	5/25/04	VOCs
CWM-183-MW18	residuum	5/24/04	VOCs
CWM-183-MW18	residuum	9/30/05	VOCs
CWM-183-MW19	bedrock	5/24/04	VOCs
CWM-183-MW19	bedrock	9/30/05	VOCs
CWM-183-MW21	residuum	10/4/05	VOCs
CWM-183-MW22	bedrock	10/4/05	VOCs
CWM-183-MW23	residuum	10/5/05	VOCs
CWM-183-MW24	residuum	10/4/05	VOCs
CWM-183-MW25	residuum	5/25/04	VOCs
CWM-183-MW25	residuum	10/5/05	VOCs
CWM-183-MW26	residuum	5/26/04	VOCs
CWM-183-MW26	residuum	9/30/05	VOCs
CWM-183-MW27	bedrock	5/25/04	VOCs
CWM-183-MW27	bedrock	10/7/05	VOCs
CWM-183-MW28	bedrock	10/7/05	VOCs
CWM-183-MW29	bedrock	10/7/05	VOCs
CWM-183-MW30	bedrock	10/7/05	VOCs
CWM-183-MW31	bedrock	10/6/05	VOCs
Surface Water Samples			
CC-510-SW-05	NA	4/21/04	VOCs
CC-510-SW-06	NA	4/21/04	VOCs
CC-510-SW-07	NA	4/21/04	VOCs
CC-510-SW-08	NA	9/28/05	VOCs
CC-510-SW-09	NA	9/28/05	VOCs
CC-510-SW-10	NA	9/28/05	VOCs

Table 4-1: Sample Designations and Analytical Parameters, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Sample Identification	Well Type	Sample Date	Analytical Parameters
Sediment Samples			
CC-510-SD-05	NA	4/23/04	VOCs
CC-510-SD-06	NA	4/23/04	VOCs
CC-510-SD-07	NA	4/23/04	VOCs
CC-510-SD-08	NA	9/28/05	VOCs
CC-510-SD-09	NA	9/28/05	VOCs
CC-510-SD-10	NA	9/28/05	VOCs
Surface Soil Samples			
CC-510-SS01	NA	9/27/05	Metals
CWM-183-SS01	NA	9/27/05	Metals
CWM-183-SS02	NA	9/27/05	Metals
CWM-183-SS03	NA	9/27/05	Metals
CWM-183-SS04	NA	9/27/05	Metals
Depositional Soil Sample			
CWM-183-DEP10	NA	9/27/05	Metals

Notes:
VOCs = volatile organic compounds by SW8260B
Metals = Total ICP metals by SW6010B and total mercury by SW7470A/7471A
NA = not applicable

Table 4-2: Monitoring Well Summary
Training Area T-6, Parcel 183(6) and Cane Creek Training Area Parcel, 510(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Year Installed	Northing	Easting	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Well Depth (feet bgs)	Screen Length (feet)	Screen Interval (feet bgs)	Midscreen Elevation (feet)
Existing Wells*										
CC-510-MW01	residuum	2003	1167019.66	670426.81	782.35	784.46	8	5	3 - 8	776.85
CC-510-MW02	residuum	2003	1166853.89	670483.90	783.18	785.5	10.5	5	5.5 - 10.5	775.18
CC-510-MW03	residuum	2003	1166955.92	670544.92	783.32	785.74	8.5	5	3.5 - 8.5	777.32
CC-510-MW04	residuum	2003	1166700.10	670502.60	787.36	789.6	15	10	5 - 15	777.36
CWM-183-MW01	residuum	2001	1165946.46	670208.96	853.77	855.91	48	15	33 - 48	813.27
CWM-183-MW02	residuum	2001	1165863.70	670484.14	827.94	829.71	36	10	26 - 36	796.94
CWM-183-MW03	residuum	2001	1166712.55	670379.40	788.81	790.81	16.5	10	6.5 - 16.5	777.31
CWM-183-MW04	residuum	2001	1166413.59	670379.99	798.34	800.51	22	10	12 - 22	781.34
CWM-183-MW05	residuum	2001	1166407.03	670533.67	796.48	798.55	12	5	7 - 12	786.98
CWM-183-MW06	residuum	2001	1166394.50	670234.64	808.91	810.92	30.7	15	15 - 30	786.41
CWM-183-MW07	residuum	2001	1166508.69	670284.13	798.83	800.93	18	10	8 - 18	785.83
CWM-183-MW08	residuum	2001	1166595.78	670223.00	796.74	798.76	18	10	8 - 18	783.74
CWM-183-MW09	residuum	2001	1166490.93	670164.19	806.95	809.18	25	10	15 - 25	786.95
CWM-183-MW10	residuum	2001	1166284.75	670416.60	799.96	802.01	20.5	10	10.5 -20.5	784.46
CWM-183-MW11	bedrock	2003	1166405.24	670248.95	807.07	809.25	100	20	80 - 100	717.07
CWM-183-MW12	residuum	2003	1166219.45	670288.77	813.03	815.36	44	15	29 - 44	776.53
CWM-183-MW13	bedrock	2003	1166423.87	670384.91	799.6	801.81	56	15	41 - 56	751.1
CWM-183-MW14	residuum	2003	1166533.63	670549.27	792.11	794.43	22.5	10	12.5 - 22.5	774.61
CWM-183-MW15	residuum	2003	1166608.85	670473.69	790.82	793.21	23	10	13 - 23	772.82
CWM-183-MW16	bedrock	2003	1166600.16	670477.23	790.88	793.13	84	10	74 - 84	711.88
CWM-183-MW17	bedrock	2003	1166723.23	670374.62	788.6	790.78	45.5	5	40.5 - 45.5	745.6
CWM-183-MW18	residuum	2003	1166855.32	670362.51	787.08	786.93	15	5	10 - 15	774.58
CWM-183-MW19	bedrock	2003	1166855.32	670365.59	787.17	787.06	100	20	80 - 100	697.17
CWM-183-MW20	bedrock	2003	1166594.56	670210.79	796.41	798.81	76	10	66 - 76	725.41
CWM-183-MW21	residuum	2003	1166492.38	670085.25	811.7	813.92	38.9	15	24 - 39	780.2
CWM-183-MW22	bedrock	2003	1166485.50	670080.79	812.28	814.59	63	10	53 - 63	754.28
CWM-183-MW23	residuum	2003	1166328.50	670206.41	819.93	822.28	50	20	30 - 50	779.93
CWM-183-MW24	residuum	2003	1166650.00	670154.17	804.89	807.23	29	10	19 - 29	780.89
Wells Installed During 2004/2005 RFI										
CWM-183-MW25	residuum	2004	1166706.50	670249.07	798.38	798.08	27.0	15	11.95-26.49	779.16
CWM-183-MW26	residuum	2004	1166453.10	670657.28	791.05	793.47	21.0	10	10.54 - 20.08	775.74

Table 4-2: Monitoring Well Summary
Training Area T-6, Parcel 183(6) and Cane Creek Training Area Parcel, 510(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Year Installed	Northing	Easting	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Well Depth (feet bgs)	Screen Length (feet)	Screen Interval (feet bgs)	Midscreen Elevation (feet)
CWM-183-MW27	bedrock	2004	1166685.11	670503.52	788.29	790.87	67.1	15	52.0 - 66.54	729.02
CWM-183-MW28	bedrock	2005	1166522.38	670232.07	799.4	802.34	199.5	10	187 - 197	607.4
CWM-183-MW29	bedrock	2005	1166297.74	670454.31	800.73	803.16	97.0	10	86 - 96	709.73
CWM-183-MW30	bedrock	2005	1166676.15	670908.75	788.7	791.29	189.5	10	177 - 187	606.7
CWM-183-MW31	bedrock	2005	1166843.51	670741.43	786.73	789.22	249.5	10	193 - 203	588.73

Notes:
bgs = below ground surface
* Source: Shaw, 2004

Table 5-1: Groundwater Elevations, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Measurement Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
May 2004						
CC-510-MW01	residuum	5/25/2004	782.35	784.46	7.33	777.13
CC-510-MW02	residuum	5/25/2004	783.18	785.5	6.59	778.91
CC-510-MW03	residuum	5/25/2004	783.32	785.74	7.46	778.28
CC-510-MW04	residuum	5/25/2004	787.36	789.6	9.33	780.27
CWM-183-MW01	residuum	5/26/2004	853.77	855.91	25.73	830.18
CWM-183-MW02	residuum	5/26/2004	827.94	829.71	11.74	817.97
CWM-183-MW03	residuum	5/25/2004	788.81	790.81	7.70	783.11
CWM-183-MW04	residuum	5/25/2004	798.34	800.51	17.94	782.57
CWM-183-MW05	residuum	5/25/2004	796.48	798.55	13.01	785.54
CWM-183-MW06	residuum	5/26/2004	808.91	810.92	25.89	785.03
CWM-183-MW07	residuum	5/26/2004	798.83	800.93	16.95	783.98
CWM-183-MW08	residuum	5/26/2004	796.74	798.76	16.35	782.41
CWM-183-MW09	residuum	5/25/2004	806.95	809.18	23.12	786.06
CWM-183-MW10	residuum	5/25/2004	799.96	802.01	19.04	782.97
CWM-183-MW12	residuum	5/25/2004	813.03	815.36	32.03	783.33
CWM-183-MW14	residuum	5/25/2004	792.11	794.43	13.08	781.35
CWM-183-MW15	residuum	5/26/2004	790.82	793.21	11.77	781.44
CWM-183-MW18	residuum	5/25/2004	787.08	786.93	4.17	782.76
CWM-183-MW21	residuum	5/26/2004	811.7	813.92	30.02	783.90
CWM-183-MW23	residuum	5/26/2004	819.93	822.28	33.54	788.74
CWM-183-MW24	residuum	5/26/2004	804.89	807.23	21.51	785.72
CWM-183-MW25	residuum	5/25/2004	798.38	798.08	14.43	783.65
CWM-183-MW26	residuum	5/25/2004	791.05	793.47	12.28	781.19
CWM-183-MW11	bedrock	5/26/2004	807.07	809.25	27.7	781.55
CWM-183-MW13	bedrock	5/25/2004	799.6	801.81	20.33	781.48
CWM-183-MW16	bedrock	5/25/2004	790.88	793.13	11.71	781.42
CWM-183-MW17	bedrock	5/25/2004	788.6	790.78	9.65	781.13
CWM-183-MW19	bedrock	5/25/2004	787.17	787.06	6.76	780.30
CWM-183-MW20	bedrock	5/26/2004	796.41	798.81	17.32	781.49
CWM-183-MW22	bedrock	5/26/2004	812.28	814.59	30.75	783.84
CWM-183-MW27	bedrock	5/25/2004	788.29	790.87	10.47	780.40
CC-510-SW-05	surface water	4/21/2004	NA	NA	NA	787.70

Table 5-1: Groundwater Elevations, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Measurement Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
CC-510-SW-06	surface water	4/21/2004	NA	NA	NA	783.30
CC-510-SW-07	surface water	4/21/2004	NA	NA	NA	774.72
Sep/Oct 2005						
CC-510-MW01	residuum	9/29/2005	782.35	784.46	8.91	775.55
CC-510-MW02	residuum	10/7/2005	783.18	785.5	6.90	778.60
CC-510-MW03	residuum	10/5/2005	783.32	785.74	8.80	776.94
CC-510-MW04	residuum	9/29/2005	787.36	789.6	9.42	780.18
CWM-183-MW04	residuum	10/10/2005	798.34	800.51	18.85	781.66
CWM-183-MW06	residuum	10/10/2005	808.91	810.92	27.63	783.29
CWM-183-MW10	residuum	10/4/2005	799.96	802.01	19.81	782.20
CWM-183-MW12	residuum	10/5/2005	813.03	815.36	33.41	781.95
CWM-183-MW14	residuum	10/4/2005	792.11	794.43	13.63	780.80
CWM-183-MW18	residuum	9/30/2005	787.08	786.93	5.81	781.12
CWM-183-MW21	residuum	10/4/2005	811.7	813.92	31.39	782.53
CWM-183-MW23	residuum	10/5/2005	819.93	822.28	32.4	789.88
CWM-183-MW24	residuum	10/4/2005	804.89	807.23	24.64	782.59
CWM-183-MW25	residuum	10/5/2005	798.38	798.08	16.35	781.73
CWM-183-MW26	residuum	9/30/2005	791.05	793.47	12.90	780.57
CWM-183-MW11	bedrock	10/10/2005	807.07	809.25	28.27	780.98
CWM-183-MW13	bedrock	10/10/2005	799.6	801.81	22.52	779.29
CWM-183-MW19	bedrock	9/30/2005	787.17	787.06	7.61	779.45
CWM-183-MW22	bedrock	10/4/2005	812.28	814.59	32.21	782.38
CWM-183-MW27	bedrock	10/7/2005	788.29	790.87	10.40	780.47
CWM-183-MW28	bedrock	10/7/2005	799.4	802.34	21.38	780.96
CWM-183-MW29	bedrock	10/7/2005	800.73	803.16	21.92	781.24
CWM-183-MW30	bedrock	10/7/2005	788.7	791.29	10.60	780.69
CWM-183-MW31	bedrock	10/6/2005	786.73	789.22	22.0	767.22
CC-510-SW-08	surface water	9/28/2005	NA	NA	NA	772.86
CC-510-SW-09	surface water	9/28/2005	NA	NA	NA	777.01
CC-510-SW-10	surface water	9/28/2005	NA	NA	NA	781.65

Notes:
BTOC = Below top of casing

Table 5-2: Horizontal Hydraulic Gradients, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Upgradient Monitoring Well	Well Type	Groundwater Elevation	Downgradient Monitoring Well	Well Type	Groundwater Elevation	Estimated Groundwater Flow Direction	Horizontal Distance	Groundwater Elevation Difference (feet)	Horizontal Gradient (feet per foot)
May 2004									
CWM-183-MW01	Residuum	830.18	CWM-183-MW14	Residuum	781.35	Northeast	679	48.83	0.072
CWM-183-MW01	Residuum	830.18	CWM-183-MW12	Residuum	783.33	Northeast	284	46.85	0.165
CWM-183-MW01	Residuum	830.18	CWM-183-MW18	Residuum	782.76	Northeast	922	47.42	0.051
CWM-183-MW01	Residuum	830.18	CC-510-MW02	Residuum	778.91	Northeast	948	51.27	0.054
CWM-183-MW04	Residuum	782.57	CWM-183-MW15	Residuum	781.44	Northeast	217	1.13	0.005
CWM-183-MW21	Residuum	783.90	CC-510-MW02	Residuum	778.91	Northeast	538	4.99	0.009
CWM-183-MW23	Residuum	788.74	CC-510-MW01	Residuum	777.13	Northeast	725	11.61	0.016
CWM-183-MW23	Residuum	788.74	CC-510-MW02	Residuum	778.91	Northeast	594	9.83	0.017
Sep/Oct 2005									
CWM-183-MW06	Residuum	783.29	CC-510-MW04	Residuum	780.18	Northeast	406	3.11	0.008
CWM-183-MW21	Residuum	782.53	CWM-183-MW19	Bedrock	779.45	Northeast	459	3.08	0.007
CWM-183-MW21	Residuum	782.53	CC-510-MW01	Residuum	775.55	Northeast	628	6.98	0.011
CWM-183-MW10	Residuum	782.20	CWM-183-MW26	Residuum	780.57	Northeast	293	1.63	0.006
CWM-183-MW21	Residuum	782.53	CC-510-MW02	Residuum	778.60	Northeast	538	3.93	0.007
CWM-183-MW23	Residuum	789.88	CC-510-MW01	Residuum	775.55	Northeast	725	14.33	0.020
CWM-183-MW23	Residuum	789.88	CC-510-MW02	Residuum	778.60	Northeast	594	11.28	0.019
CWM-183-MW23	Residuum	789.88	CWM-183-MW06	Residuum	783.29	Northeast	72	6.59	0.092
CWM-183-MW04	Residuum	781.66	CC-510-MW04	Residuum	780.18	Northeast	312	1.48	0.005
CWM-183-MW29	Bedrock	781.24	CWM-183-MW13	Bedrock	779.29	North	144	1.95	0.014
CWM-183-MW22	Bedrock	782.38	CWM-183-MW28	Bedrock	780.96	East	156	1.42	0.009
CWM-183-MW30	Bedrock	780.69	CWM-183-MW31	Bedrock	767.22	North	237	13.47	0.057

Notes:

Elevations in feet above mean sea level.

Horizontal gradients have been calculated based on site-wide data suggesting that the groundwater in the residuum and bedrock zones are hydraulically connected.

Table 5-3: Vertical Hydraulic Gradients, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Cluster IDs	Well Completion Zone	Midpoint of Screen (Elevation)	Groundwater Elevation (May 04)	Groundwater Elevation (Sep/Oct 05)	dH (May 04)	dH (Sep/Oct 05)	dL	Vertical Hydraulic Gradient (ft/ft) (May 04)	Vertical Hydraulic Gradient (ft/ft) (Sep/Oct 05)
CWM-183-MW06	residuum	786.41	785.03	783.29	3.48	2.31	69.34	0.050	0.033
CWM-183-MW11	bedrock	717.07	781.55	780.98					
CWM-183-MW15	residuum	772.82	781.44	--	0.02	--	60.94	0.0003	--
CWM-183-MW16	bedrock	711.88	781.42	--					
CWM-183-MW18	residuum	774.58	782.76	781.12	2.46	1.67	77.41	0.032	0.022
CWM-183-MW19	bedrock	697.17	780.30	779.45					
CWM-183-MW08	residuum	783.74	782.41	--	0.92	--	58.33	0.016	--
CWM-183-MW20	bedrock	725.41	781.49	--					
CWM-183-MW21	residuum	780.2	783.90	782.53	0.06	0.15	25.92	0.002	0.006
CWM-183-MW22	bedrock	754.28	783.84	782.38					
CWM-183-MW04	residuum	781.34	782.57	781.66	1.09	2.37	30.24	0.036	0.078
CWM-183-MW13	bedrock	751.1	781.48	779.29					
CWM-183-MW03	residuum	777.31	783.11	--	1.98	--	31.71	0.062	--
CWM-183-MW17	bedrock	745.6	781.13	--					
CC-510-MW04	residuum	777.36	780.27	780.18	-0.13	-0.29	48.34	-0.003	-0.006
CWM-183-MW27	bedrock	729.02	780.40	780.47					
CC-510-SW/SD-07	surface water	774.72	774.72	--	--	-2.41	2.13	-1.131	--
CC-510-MW01	residuum	776.85	777.13	--					
CC-510-SW/SD-06	surface water	783.30	783.30	--	3.03	--	5.94	0.510	--
CC-510-MW04	residuum	777.36	780.27	--					
CC-510-SW/SD-08	surface water	772.86	--	772.86	--	-2.69	3.99	--	-0.674
CC-510-MW01	residuum	776.85	--	775.55					
CC-510-SW/SD-09	surface water	777.01	--	777.01	--	0.07	0.31	--	0.226
CC-510-MW03	residuum	777.32	--	776.94					

Table 5-3: Vertical Hydraulic Gradients, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Cluster IDs	Well Completion Zone	Midpoint of Screen (Elevation)	Groundwater Elevation (May 04)	Groundwater Elevation (Sep/Oct 05)	dH (May 04)	dH (Sep/Oct 05)	dL	Vertical Hydraulic Gradient (ft/ft) (May 04)	Vertical Hydraulic Gradient (ft/ft) (Sep/Oct 05)
CC-510-SW/SD-10	surface water	781.65	--	781.65	--	1.08	5.91	--	0.183
CWM-183-MW26	residuum	775.74	--	780.57					

Notes:
Elevations in feet above mean sea level.
ft bgs = feet below ground surface
dH = Difference in groundwater elevation (feet) for surface water samples, groundwater elevation is considered surface water elevation
dL = Difference in midscreen elevation (feet) for surface water samples, midscreen elevation is considered surface water elevation
ft/ft = feet per foot (a negative value indicates an upward vertical gradient)

-- = Surface water survey data not collected that year or groundwater elevation data not collected in 2005.

Table 5-4: Summary of Slug Test Hydraulic Conductivities
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

		Falling Head Slug Test			Rising Head Slug Test			
Well Cluster IDs	**Lithology of Screened Interval**	**Test 1 Hydraulic Conductivity (ft/day)**	**Test 2 Hydraulic Conductivity (ft/day)**	**Test 3 Hydraulic Conductivity (ft/day)**	**Test 1 Hydraulic Conductivity (ft/day)**	**Test 2 Hydraulic Conductivity (ft/day)**	**Test 3 Hydraulic Conductivity (ft/day)**	**Average Hydraulic Conductivity (ft/day)**
CWM-183-MW25	highly weathered shale	23.3	48.0	39.6	40.1	60.7	34.1	**40.5**
CWM-183-MW26	residuum/fractured limestone	846	432	285	2,755	431	763	**618**
CWM-183-MW27	highly fractured limestone bedrock	2,190	2,302	2,711	5,702	5,767	13,326	**4,121**

Notes:
ft/sec = feet per second
Hydraulic conductivities calculated by AquiferWin32 software, Version 2.0 using the Bouwer and Rice Method analysis for unconfined aquifers.
Average hydraulic conductivities were calculated after dismissing the highest and lowest conductivity at each monitoring well.

Table 5-5: Groundwater Chemical and Physical Parameters, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Sample Date	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Oxidation Reduction Potential (mV)
May 2004							
CC-510-MW01	5/27/2004	19.65	6.41	0.278	9.21	8.7	245.9
CC-510-MW02	5/27/2004	20.26	6.64	0.263	9.19	3.5	217.2
CC-510-MW03	5/28/2004	19.05	6.80	0.343	9.15	189.8	217.2
CC-510-MW04	5/25/2004	23.50	7.14	0.384	11.19	18.1	266.2
CWM-183-MW03	5/25/2004	23.38	7.00	0.481	9.68	18.2	121.1
CWM-183-MW04	5/28/2004	19.09	6.12	0.281	7.76	1.7	197.2
CWM-183-MW09	5/27/2004	19.68	6.48	0.227	6.76	104.4	165.0
CWM-183-MW10	5/27/2004	19.04	6.60	0.247	9.20	241.7	143.1
CWM-183-MW12	5/26/2004	22.26	6.33	0.241	9.51	273.6	216.0
CWM-183-MW13	5/27/2004	22.62	7.06	0.212	9.08	4.8	138.0
CWM-183-MW14	5/27/2004	19.92	7.42	0.265	9.83	30.1	209.8
CWM-183-MW16	5/27/2004	19.60	7.31	0.291	8.30	40.2	-91.1
CWM-183-MW17	5/25/2004	20.10	7.29	0.535	10.50	39.5	-112.0
CWM-183-MW18	5/24/2004	22.99	7.30	0.627	6.92	9.6	71.1
CWM-183-MW19	5/24/2004	22.66	7.49	0.355	6.92	9.7	-52.1
CWM-183-MW25	5/25/2004	20.32	6.77	0.548	7.82	101.0	177.5
CWM-183-MW26	5/26/2004	20.90	7.05	0.484	9.53	29.6	74.2
CWM-183-MW27	5/25/2004	19.50	11.15	2.275	7.18	36.4	-16.0
Sep/Oct 2005							
CC-510-MW01	9/29/2005	23.71	6.60	0.287	2.79	63	-43
CC-510-MW02	10/7/2005	21.12	6.97	0.273	1.44	215	-25
CC-510-MW03	10/5/2005	24.50	7.14	0.250	6.87	999+	172
CC-510-MW04	9/29/2005	20.13	6.42	0.234	5.98	250	101
CWM-183-MW04	10/10/2005	18.49	6.35	0.374	0.50	999+	-50
CWM-183-MW06	10/10/2005	17.60	6.55	0.301	3.51	999+	174
CWM-183-MW10	10/4/2005	17.38	6.15	0.174	0.77	47	110
CWM-183-MW11	10/10/2005	16.85	7.88	0.161	4.50	165	110
CWM-183-MW12	10/5/2005	25.30	6.26	0.181	3.81	386	221
CWM-183-MW13	10/10/2005	18.29	8.02	0.217	3.75	110	141
CWM-183-MW14	10/4/2005	20.60	7.32	0.222	0.74	999+	158
CWM-183-MW18	9/30/2005	20.81	7.04	0.295	0.36	263	-87
CWM-183-MW19	9/30/2005	19.60	7.43	0.239	0.57	105	-87

Table 5-5: Groundwater Chemical and Physical Parameters, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Sample Date	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Oxidation Reduction Potential (mV)
CWM-183-MW21	10/4/2005	19.00	7.44	0.144	0.39	999+	68
CWM-183-MW22	10/4/2005	17.65	10.50	0.210	9.15	152	40
CWM-183-MW23	10/5/2005	18.46	6.48	0.142	1.18	999+	208
CWM-183-MW24	10/4/2005	18.42	6.52	0.268	0.36	261	-51
CWM-183-MW25	10/5/2005	19.73	6.71	0.321	0.44	227	-32
CWM-183-MW26	9/30/2005	20.41	6.68	0.363	0.80	-8.0*	67
CWM-183-MW27	10/7/2005	17.24	11.63	0.660	0.47	201	-72
CWM-183-MW28	10/7/2005	18.79	8.89	0.207	1.08	265	-43
CWM-183-MW29	10/7/2005	16.67	7.60	0.236	6.76	360	-112
CWM-183-MW30	10/7/2005	18.48	10.84	0.397	0.59	243	-29
CWM-183-MW31	10/6/2005	23.02	9.59	0.289	0.80	999+	35

Notes:
°C = Degrees celsius
mg/L = milligrams per liter
mS/cm = millisiemens per centimeter
mV = millivolts
NTU = nephelometric turbidity units
999+ = Turbidity reading was above the instrument limit of 999 NTU.
* Instrument showed a negative value for turbidity, turbidity is considered zero for this well.

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CC-510-MW01 5/27/2004 (residuum)	CC-510-MW01 9/29/2005 (residuum)	CC-510-MW02 5/27/2004 (residuum)	CC-510-MW02 10/7/2005 (residuum)	CC-510-MW03 5/28/2004 (residuum)	CC-510-MW03 10/5/2005 (residuum)	CC-510-MW04 5/25/2004 (residuum)	CC-510-MW04 9/29/2005 (residuum)
VOCs (µg/L)								
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1	1.4	3.3
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	< 10 (UJC)	< 10	< 10 (UJC)	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon Disulfide	< 1 (UJC)	< 1 (UJCL)	< 1 (UJC)	< 1	< 1	< 1	< 1	< 1 (UJCL)
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	< 1	< 1	< 1	< 1	< 1	< 1	1	1
Cis-1,2-Dichloroethene	< 1	< 1	5.4	1.8	< 1	< 1	0.39 J	1.1
Tetrachloroethene	< 1	< 1	< 1	< 1	< 1	< 1	0.26 J	0.42 J
Toluene	< 1	0.36 J	< 1	< 1	< 1	< 1	< 1	< 1
Trans-1,2-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	< 1	< 1	5.3	1.3	< 1	0.29 J	30	71
Vinyl Chloride	< 1	< 1	0.42 J	0.38 J	< 1	< 1	< 1	< 1
Xylenes (total)	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Metals (mg/L)								
Aluminum	--	0.238	--	--	--	--	--	--
Arsenic	--	0.00627 J	--	--	--	--	--	--
Barium	--	0.0555	--	--	--	--	--	--
Calcium	--	49.5	--	--	--	--	--	--
Cobalt	--	0.00745 J	--	--	--	--	--	--
Iron	--	15.7	--	--	--	--	--	--
Magnesium	--	22.9	--	--	--	--	--	--
Manganese	--	1.41	--	--	--	--	--	--
Potassium	--	5.8	--	--	--	--	--	--
Sodium	--	8.36	--	--	--	--	--	--
Zinc	--	0.0204 J	--	--	--	--	--	--

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CWM-183-MW03 5/25/2004 (residuum)	CWM-183-MW04 5/28/2004 (residuum)	CWM-183-MW04 10/10/2005 (residuum)	CWM-183-MW06 10/10/2005 (residuum)	CWM-183-MW09 5/27/2004 (residuum)	CWM-183-MW10 5/27/2004 (residuum)	CWM-183-MW10 10/4/2005 (residuum)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	0.36 J	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	3.1	0.69 J	32	390	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1	1.4	< 1	< 1
1,1-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	0.45 J	0.59 J	< 1	< 1	< 1	< 1
Acetone	< 10	< 10	< 10	< 10	< 10 (UJC)	< 10	< 10 (UJC)
Bromodichloromethane	< 1	< 1	< 1	1.5	< 1	< 1	< 1
Carbon Disulfide	< 1	< 1	< 1	< 1	< 1 (UJC)	< 1 (UJC)	< 1
Carbon Tetrachloride	< 1	< 1	< 1	0.38 J	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	0.24 J	< 1	< 1	1100 (JA)	1.6	< 1	< 1
Cis-1,2-Dichloroethene	< 1	5.8	5.9	< 1	3.9	< 1	< 1
Tetrachloroethene	< 1	0.22 J	< 1	0.76 J	7.1	< 1	< 1
Toluene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trans-1,2-Dichloroethene	< 1	0.96 J	0.96 J	< 1	1.7	< 1	< 1
Trichloroethene	0.23 J	7.9	8.5	35	510	0.23 J	< 1
Vinyl Chloride	< 1	0.39 J	1.7	< 1	< 1	< 1	< 1
Xylenes (total)	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Metals (mg/L)							
Aluminum	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CWM-183-MW11 10/10/2005 (bedrock)	CWM-183-MW12 5/27/2004 (residuum)	CWM-183-MW12 10/5/2005 (residuum)	CWM-183-MW13 5/27/2004 (bedrock)	CWM-183-MW13 10/10/2005 (bedrock)	CWM-183-MW14 5/27/2004 (residuum)	CWM-183-MW14 10/4/2005 (residuum)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	0.37 J	2.7	4	15	9	< 1	< 1
1,1,2-Trichloroethane	0.45 J	< 1	< 1	0.23 J	< 1	< 1	< 1
1,1-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	< 10	< 10 (UJC)	< 10	< 10 (UJC)	< 10	< 10 (UJC)	< 10 (UJC)
Bromodichloromethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon Disulfide	< 1	< 1 (UJC)	< 1	< 1 (UJC)	< 1	< 1 (UJC)	< 1
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	0.56 J	3.3	4.5	0.97 J	0.7 J	0.98 J	0.7 J
Cis-1,2-Dichloroethene	3.9	< 1	< 1	4.4	2.5	0.91 J	0.45 J
Tetrachloroethene	0.93 J	< 1	< 1	1.4	1.2	0.21 J	< 1
Toluene	< 1	< 1	< 1	< 1	0.28 J	< 1	< 1
Trans-1,2-Dichloroethene	< 1	< 1	< 1	0.77 J	0.73 J	< 1	< 1
Trichloroethene	83	2.6	2.8	150	120	32	21
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes (total)	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Metals (mg/L)							
Aluminum	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CWM-183-MW16 5/27/2004 (bedrock)	CWM-183-MW17 5/25/2004 (bedrock)	CWM-183-MW18 5/24/2004 (residuum)	CWM-183-MW18 9/30/2005 (residuum)	CWM-183-MW19 5/24/2004 (bedrock)	CWM-183-MW19 9/30/2005 (bedrock)	CWM-183-MW21 10/4/2005 (residuum)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1	2.9
1,1,2-Trichloroethane	0.42 J	< 1	< 1	< 1	< 1	< 1	1.6
1,1-Dichloroethene	0.41 J	< 1	< 1	< 1	< 1	< 1	1.1
1,2,4-Trimethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	< 10 (UJC)	< 10	< 10	< 10	< 10	< 10	< 10 (UJC)
Bromodichloromethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbon Disulfide	< 1 (UJC)	< 1	< 1	< 1 (UJCL)	< 1	< 1 (UJCL)	< 1
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1	3.1
Chloroform	1.9	0.56 J	< 1	< 1	< 1	< 1	0.55 J
Cis-1,2-Dichloroethene	1.3	0.61 J	< 1	< 1	< 1	< 1	40
Tetrachloroethene	0.53 J	0.3 J	< 1	< 1	< 1	< 1	3.3
Toluene	0.34 J	< 1	< 1	< 1	< 1	0.28 J	< 1
Trans-1,2-Dichloroethene	< 1	0.29 J	< 1	< 1	< 1	< 1	4.3
Trichloroethene	170	71	< 1	< 1	< 1	< 1	430
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes (total)	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Metals (mg/L)							
Aluminum	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CWM-183-MW22 10/4/2005 (bedrock)	CWM-183-MW23 10/5/2005 (residuum)	CWM-183-MW24 10/4/2005 (residuum)	CWM-183-MW25 5/25/2004 (residuum)	CWM-183-MW25 10/5/2005 (residuum)	CWM-183-MW26 5/26/2004 (residuum)	CWM-183-MW26 9/30/2005 (residuum)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane	< 1	4.4	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	12000	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	< 1	6.7	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene	0.6 J	0.42 J	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	2.5 J	< 10 (UJC)	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane	< 1	0.27 J	< 1	< 1	< 1	< 1	< 1
Carbon Disulfide	0.24 J	< 1	< 1	< 1	< 1	< 1	< 1 (UJCL)
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	4.9	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	< 1	22	< 1	< 1	< 1	< 1	< 1
Cis-1,2-Dichloroethene	35	49	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	1.2	110 (JS)	< 1	< 1	< 1	< 1	< 1
Toluene	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trans-1,2-Dichloroethene	4.1	3.9	< 1	< 1	< 1	< 1	< 1
Trichloroethene	170	3600 (JS)	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes (total)	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Metals (mg/L)							
Aluminum	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--
Iron	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CWM-183-MW27 5/25/2004 (bedrock)	CWM-183-MW27 10/7/2005 (bedrock)	CWM-183-MW28 10/7/2005 (bedrock)	CWM-183-MW29 10/7/2005 (bedrock)	CWM-183-MW30 10/7/2005 (bedrock)	CWM-183-MW31 10/6/2005 (bedrock)
VOCs (µg/L)						
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	0.46 J	< 1	10	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene	0.29 J	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	< 1	< 1	0.28 J	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	9.9 J	< 10	< 10	43	1500 (JA)	2.1 J
Bromodichloromethane	< 1	< 1	< 1	0.23 J	< 1	< 1
Carbon Disulfide	< 1	< 1	< 1	< 1	0.24 J	0.28 J
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1	< 1
Chloroform	1.4	0.8 J	0.39 J	1.9	0.23 J	< 1
Cis-1,2-Dichloroethene	2	2.3	< 1	1.5	< 1	< 1
Tetrachloroethene	1.6	1.3	< 1	0.71 J	< 1	< 1
Toluene	< 1	< 1	0.86 J	4.9	0.28 J	0.54 J
Trans-1,2-Dichloroethene	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	130	88	0.28 J	61	< 1	< 1
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1	< 1
Xylenes (total)	< 3	< 3	0.87 J	< 3	< 3	< 3
Metals (mg/L)						
Aluminum	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	--	--	--	--	--	--
Calcium	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--
Iron	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--
Manganese	--	--	--	--	--	--
Potassium	--	--	--	--	--	--
Sodium	--	--	--	--	--	--
Zinc	--	--	--	--	--	--

Table 5-6: Summary of Groundwater Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Notes:
< = The result was not detected at the concentration shown.
µg/L = micrograms per liter
mg/L = milligrams per liter
VOC = Volatile organic compound
-- = not sampled
Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.
Validation Flag:
(JA) = Estimated detection; internal standard was outside method-specific criteria.
(JS) = Estimated detection; surrogate recovery was outside laboratory historical control limits.
(UJC) = Reported quantitation limit is estimated; continuing calibration was outside method-specific control limits.
(UJCL) = Reported quantitation limit is estimated; continuing calibration is outside method-specific control limits, and the LCS and LCSD recoveries were outside laboratory historical control limits.

Table 5-7: Summary of Surface Water Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CC-510-SW-05 4/21/2004	CC-510-SW-06 4/21/2004	CC-510-SW-07 4/21/2004	CC-510-SW-08 9/28/2005	CC-510-SW-09 9/28/2005	CC-510-SW-10 9/28/2005
VOCs (µg/L)						
1,1,2,2-Tetrachloroethane	< 1	< 1	0.9 J	2.1	3.3	< 1
Cis-1,2-Dichloroethene	< 1	0.3 J	0.23 J	0.29 J	0.71 J	< 1
Trichloroethene	1.5	11	4.7	5.8	15	< 1

Notes:
< = The result was not detected at the concentration shown.
µg/L = microgram per liter
VOC = Volatile organic compound

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Table 5-8: Summary of Sediment Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	CC-510-SD-05 4/23/2004	CC-510-SD-06 4/23/2004	CC-510-SD-07 4/23/2004	CC-510-SD-08 9/28/2005	CC-510-SD-09 9/28/2005	CC-510-SD-10 9/28/2005
VOCs (µg/kg)						
Cis-1,2-Dichloroethene	8.8	< 6.3	< 6.1	< 6.1	< 6.5	< 6.5
Trichloroethene	20	5.4 J	< 6.1	< 6.1	< 6.5	< 6.5
Vinyl Chloride	17	< 6.3	< 6.1	< 6.1	< 6.5	< 6.5

Notes:
< = The result was not detected at the concentration shown.
µg/kg = microgram per kilogram
VOC = Volatile organic compound

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Table 5-9: Summary of Surface and Depositional Soil Detections, 2004/2005 RFI
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Metals (mg/kg)	CC-510-SS001 (0-1 feet) 9/27/2005	CWM-183-SS001 (0-1 feet) 9/27/2005	CWM-183-SS002 (0-1 feet) 9/27/2005	CWM-183-SS003 (0-1 feet) 9/27/2005	CWM-183-SS004 (0-1 feet) 9/27/2005	CWM-183-DEP10 (0-0.5 feet) 9/27/2005
Aluminum	10500	11900	12400	19300	19600	11100
Antimony	< 11.5 (UJM-)	4 J (J-)	3.09 J (J-)	2.67 J (J-)	4.13 J (J-)	< 11.3
Arsenic	6.65	5.29	7.72	8.41	5.8	4.17
Barium	89.3	89.5	69.6	164	173	133
Beryllium	0.992 J	0.764 J	0.749 J	2.56	1.23	0.994 J
Calcium	1560	152	1060	980	311	2440
Chromium	21.8	30.1	16.9	28.1	25.8	12
Cobalt	10.3	14.4	4.14	53.1	4.6	9.31
Copper	17.3	19.3	49.5	44.3	21	14.1
Iron	24800	25800	26000	51400	20300	19100
Lead	40.3	44.9	44.9	64.8	30.7	27.8
Magnesium	662	580	665	931	957	865
Manganese	752	1130	171	2860	1380	622
Mercury	< 0.115	0.0945 J	0.0822 J	1.05	0.108 J	0.056 J
Nickel	8.14	5.73 U^ (UB)	6.66 U^ (UB)	27.5	7.29	10.5
Potassium	1610	1240	2090	1810	1250	2450
Selenium	0.847 J (JM)	0.991 J	1.54	1.24	0.854 J	< 1.13
Sodium	34.1 J (J-)	< 120 (UJ-)	33.6 J (J-)	< 119 (UJ-)	33.4 J (J-)	< 113 (UJ-)
Thallium	0.871 J	0.884 J	1.03 J	2.79	< 2.33	< 2.26
Vanadium	28.5	29.5	34.5	40.9	38	17.7
Zinc	46.5	93.1	56.5	66.4	51.7	38.6

Notes:
< = The result was not detected at the concentration shown.
mg/kg = milligrams per kilogram

Lab Flags:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit (RL) but greater than the method detection limit (MDL).
U^ = Analyte is not detected above the RL; lab flag updated by MES data reviewer.

Validation Flag:
(JM) = Estimated detection; the MS and MSD recoveries were outside laboratory historical control limits.
(J-) = Estimated detection; analyte was reported as a negative concentration in the method or continuing calibration blank, reported result may be biased low.
(UB) = Result was qualified as not detected based on method blank or continuing calibration blank contamination.
(UJ-) = Reported quantitation limit is estimated; analyte was reported as a negative concentration in the method or continuing calibration blank, reported result may be a false negative.
(UJM) = Reported quantitation limit is estimated; the MS and MSD recoveries were outside laboratory historical control limits.

Table 5-10: Groundwater VOC Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CC-510-MW01 9/29/2005 (RFI) (residuum)	CC-510-MW02 10/7/2005 (RFI) (residuum)	CC-510-MW03 10/5/2005 (RFI) (residuum)	CC-510-MW04 9/29/2005 (RFI) (residuum)	CWM-183-MW03 5/25/2004 (RFI) (residuum)
1,1,1,2-Tetrachloroethane	1.57	10.2	254					
1,1,2,2-Tetrachloroethane	0.203	1.36	34				**3.3**	
1,1,2-Trichloroethane	0.720	5.02	126					
1,1-Dichloroethene	76.4	480	12,000					
1,2,4-Trimethylbenzene	6	286	7140					
1,2-Dichloroethane	0.448	3.08	76.9					
Acetone	1410	9170	229,000					
Benzene	0.923	4.79	120					
Bromodichloromethane	0.653	4.5	112					
Carbon Disulfide	151	921	23,000					
Carbon tetrachloride	0.409	1.98	49.5					
Chlorobenzene	29.5	175	4370					
Chloroform	15.4	98.6	2465				1	0.24 J
Cis-1,2-Dichloroethene	15.5	99.1	2480		1.8		1.1	
Tetrachloroethene	0.121	0.443	11.1				0.42 J	
Toluene	294	1730	43,100	0.36 J				
Trans-1,2-Dichloroethene	30.7	195	4863					
Trichloroethene	3.83	20.5	513		1.3	0.29 J	**71**	0.23 J
Vinyl chloride	0.0918	0.386	9.65		0.38 J			
Xylenes (total)	91.2	1539	38,500					

Table 5-10: Groundwater VOC Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CWM-183-MW04 10/10/2005 (RFI) (residuum)	CWM-183-MW06 10/10/2005 (RFI) (residuum)	CWM-183-MW07 1/29/2003 (RI) (residuum)	CWM-183-MW08 1/23/2003 (RI) (residuum)	CWM-183-MW09 5/27/2004 (RFI) (residuum)
1,1,1,2-Tetrachloroethane	1.57	10.2	254			2.2		0.36 J
1,1,2,2-Tetrachloroethane	0.203	1.36	34	0.69 J	**32**	***8600***	***75***	***390***
1,1,2-Trichloroethane	0.720	5.02	126			**64**	0.66 J (J)	1.4
1,1-Dichloroethene	76.4	480	12,000			1.3		
1,2,4-Trimethylbenzene	6	286	7140					
1,2-Dichloroethane	0.448	3.08	76.9	0.59 J		0.49 J (J)		
Acetone	1410	9170	229,000					
Benzene	0.923	4.79	120			0.58 J (J)		
Bromodichloromethane	0.653	4.5	112		1.5	1.1		
Carbon Disulfide	151	921	23,000					
Carbon tetrachloride	0.409	1.98	49.5		0.38 J			
Chlorobenzene	29.5	175	4370			0.85 J (J)		
Chloroform	15.4	98.6	2465		**1100 (JA)**	**140**	1.8	1.6
Cis-1,2-Dichloroethene	15.5	99.1	2480	5.9		**180**	5.2	3.9
Tetrachloroethene	0.121	0.443	11.1		**0.76 J**	***57***	**2.3**	**7.1**
Toluene	294	1730	43,100					
Trans-1,2-Dichloroethene	30.7	195	4863	0.96 J		42	0.59 J (J)	1.7
Trichloroethene	3.83	20.5	513	8.5	**35**	***5500***	**150**	**510**
Vinyl chloride	0.0918	0.386	9.65	**1.7**		**1.2**		
Xylenes (total)	91.2	1539	38,500					

Table 5-10: Groundwater VOC Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CWM-183-MW12 10/5/2005 (RFI) (residuum)	CWM-183-MW14 10/4/2005 (RFI) (residuum)	CWM-183-MW15 3/4/2003 (RI) (residuum)	CWM-183-MW21 10/4/2005 (RFI) (residuum)	CWM-183-MW23 10/5/2005 (RFI) (residuum)
1,1,1,2-Tetrachloroethane	1.57	10.2	254					4.4
1,1,2,2-Tetrachloroethane	0.203	1.36	34	**4**			**2.9**	***12000***
1,1,2-Trichloroethane	0.720	5.02	126				1.6	**6.7**
1,1-Dichloroethene	76.4	480	12,000				1.1	0.42 J
1,2,4-Trimethylbenzene	6	286	7140					
1,2-Dichloroethane	0.448	3.08	76.9					
Acetone	1410	9170	229,000					
Benzene	0.923	4.79	120					
Bromodichloromethane	0.653	4.5	112					0.27 J
Carbon Disulfide	151	921	23,000					
Carbon tetrachloride	0.409	1.98	49.5					
Chlorobenzene	29.5	175	4370				3.1	
Chloroform	15.4	98.6	2465	4.5	0.7 J	2.6	0.55 J	22
Cis-1,2-Dichloroethene	15.5	99.1	2480		0.45 J	0.23 J (J)	40	49
Tetrachloroethene	0.121	0.443	11.1				**3.3**	***110 (JS)***
Toluene	294	1730	43,100					
Trans-1,2-Dichloroethene	30.7	195	4863				4.3	3.9
Trichloroethene	3.83	20.5	513	2.8	**21**	**25**	**430**	***3600 (JS)***
Vinyl chloride	0.0918	0.386	9.65					
Xylenes (total)	91.2	1539	38,500					

Table 5-10: Groundwater VOC Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CWM-183-MW11 10/10/2005 (RFI) (bedrock)	CWM-183-MW13 10/10/2005 (RFI) (bedrock)	CWM-183-MW16 5/27/2004 (RFI) (bedrock)	CWM-183-MW17 5/25/2004 (RFI) (bedrock)	CWM-183-MW19 9/30/2005 (RFI) (bedrock)
1,1,1,2-Tetrachloroethane	1.57	10.2	254					
1,1,2,2-Tetrachloroethane	0.203	1.36	34	0.37 J	**9**			
1,1,2-Trichloroethane	0.720	5.02	126	0.45 J		0.42 J		
1,1-Dichloroethene	76.4	480	12,000			0.41 J		
1,2,4-Trimethylbenzene	6	286	7140					
1,2-Dichloroethane	0.448	3.08	76.9					
Acetone	1410	9170	229,000					
Benzene	0.923	4.79	120					
Bromodichloromethane	0.653	4.5	112					
Carbon Disulfide	151	921	23,000					
Carbon tetrachloride	0.409	1.98	49.5					
Chlorobenzene	29.5	175	4370					
Chloroform	15.4	98.6	2465	0.56 J	0.7 J	1.9	0.56 J	
Cis-1,2-Dichloroethene	15.5	99.1	2480	3.9	2.5	1.3	0.61 J	
Tetrachloroethene	0.121	0.443	11.1	**0.93 J**	**1.2**	**0.53 J**	0.3 J	
Toluene	294	1730	43,100		0.28 J	0.34 J		0.28 J
Trans-1,2-Dichloroethene	30.7	195	4863		0.73 J		0.29 J	
Trichloroethene	3.83	20.5	513	**83**	**120**	**170**	**71**	
Vinyl chloride	0.0918	0.386	9.65					
Xylenes (total)	91.2	1539	38,500					

Table 5-10: Groundwater VOC Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CWM-183-MW20 3/7/2003 (RI) (bedrock)	CWM-183-MW22 10/4/2005 (RFI) (bedrock)	CWM-183-MW27 10/7/2005 (RFI) (bedrock)	CWM-183-MW28 10/7/2005 (RFI) (bedrock)	CWM-183-MW29 10/7/2005 (RFI) (bedrock)
1,1,1,2-Tetrachloroethane	1.57	10.2	254	0.73 J (J)				
1,1,2,2-Tetrachloroethane	0.203	1.36	34	**18**		0.46 J		**10**
1,1,2-Trichloroethane	0.720	5.02	126	2.4				
1,1-Dichloroethene	76.4	480	12,000	0.85 J (J)	0.6 J			
1,2,4-Trimethylbenzene	6	286	7140				0.28 J	
1,2-Dichloroethane	0.448	3.08	76.9					
Acetone	1410	9170	229,000		2.5 J			43
Benzene	0.923	4.79	120					
Bromodichloromethane	0.653	4.5	112					0.23 J
Carbon Disulfide	151	921	23,000		0.24 J			
Carbon tetrachloride	0.409	1.98	49.5					
Chlorobenzene	29.5	175	4370		4.9			
Chloroform	15.4	98.6	2465	4.4		0.8 J	0.39 J	1.9
Cis-1,2-Dichloroethene	15.5	99.1	2480	8.5	35	2.3		1.5
Tetrachloroethene	0.121	0.443	11.1	***28***	**1.2**	**1.3**		**0.71 J**
Toluene	294	1730	43,100				0.86 J	4.9
Trans-1,2-Dichloroethene	30.7	195	4863	1.2	4.1			
Trichloroethene	3.83	20.5	513	***3700***	**170**	**88**	0.28 J	**61**
Vinyl chloride	0.0918	0.386	9.65					
Xylenes (total)	91.2	1539	38,500				0.87 J	

Table 5-10: Groundwater VOC Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CWM-183-MW30 10/7/2005 (RFI) (bedrock)	CWM-183-MW31 10/6/2005 (RFI) (bedrock)
1,1,1,2-Tetrachloroethane	1.57	10.2	254		
1,1,2,2-Tetrachloroethane	0.203	1.36	34		
1,1,2-Trichloroethane	0.720	5.02	126		
1,1-Dichloroethene	76.4	480	12,000		
1,2,4-Trimethylbenzene	6	286	7140		
1,2-Dichloroethane	0.448	3.08	76.9		
Acetone	1410	9170	229,000	1500 (JA)	2.1 J
Benzene	0.923	4.79	120		
Bromodichloromethane	0.653	4.5	112		
Carbon Disulfide	151	921	23,000	0.24 J	0.28 J
Carbon tetrachloride	0.409	1.98	49.5		
Chlorobenzene	29.5	175	4370		
Chloroform	15.4	98.6	2465	0.23 J	
Cis-1,2-Dichloroethene	15.5	99.1	2480		
Tetrachloroethene	0.121	0.443	11.1		
Toluene	294	1730	43,100	0.28 J	0.54 J
Trans-1,2-Dichloroethene	30.7	195	4863		
Trichloroethene	3.83	20.5	513		
Vinyl chloride	0.0918	0.386	9.65		
Xylenes (total)	91.2	1539	38,500		

Notes:
µg/L = micrograms per liter
SSSL = Site-Specific Screening Level (most restrictive between cancer and non-cancer SSSL is shown)
VOC = Volatile organic compound
RI = 2003 Remedial Investigation (Shaw, 2004)
RFI = 2004/2005 RCRA Facility Investigation

Value exceeds the Residential SSSL.
Value exceeds the Groundskeeper SSSL.
Value exceeds the Construction Worker SSSL.

Laboratory flag:
J = Reported value is an estimated concentration.
Validation flags:
(J) = Reported value is an estimated concentration.
(JA) = Estimated detection; internal standard was outside method-specific criteria.
(JS) = Estimated detection; surrogate recovery was outside laboratory control limits.

Table 5-11: Groundwater Metal Contaminants Compared to SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Metals (mg/L)	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	CC-510-MW03 1/9/2003 (SI) (residuum)	CC-510-MW04 1/7/2003 (SI) (residuum)	CWM-183-MW01 1/21/2003 (RI) (residuum)	CWM-183-MW06 1/29/2003 (RI) (residuum)	CWM-183-MW07 1/29/2003 (RI) (residuum)	CWM-183-MW12 2/6/2003 (RI) (residuum)
Nickel	0.0313	0.202	5.06	0.0152 J (J)		0.0236	0.137	0.0286	0.0241
Thallium	0.00011	0.000712	0.0178		**0.0054 J (J)**				

Notes:
mg/L = milligrams per liter
SSSL = Site-Specific Screening Level
RI = 2003 Remedial Investigation for Parcel 183(6) (Shaw, 2004)
SI = 2001 Site Investigation for Parcel 183(6) (Shaw, 2004)

Laboratory flag:
J = Reported value is an estimated concentration.
Validation flag:
(J) = Reported value is an estimated concentration.

Value exceeds the Residential SSSL.
Value exceeds the Groundskeeper SSSL.

Table 5-12: Surface Water VOC Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

VOCs (µg/L)	Recreational SSSL	ESV	CC-510-SW/SD01 1/21/2003 (SI)	CC-510-SW/SD02 1/21/2003 (SI)	CC-510-SW/SD03 1/21/2003 (SI)	CC-510-SW/SD04 1/22/2003 (SI)	CC-510-SW-05 4/21/2004 (RFI)
1,1,2,2-Tetrachloroethane	5.01	240	2	1.1		6.5	
1,1-Dichloroethene	700	303			0.45 J (J)		
Chloroform	147	289				0.45 J (J)	
Cis-1,2-Dichloroethene	149	11600	0.59 J (J)	0.7 J (J)	87	5.5	
Tetrachloroethene	1.48	84				0.52 J (J)	
Toluene	2320	175				0.23 J (J)	
Trans-1,2-Dichloroethene	287	1350			0.54 J (J)	0.34 J (J)	
Trichloroethene	74.5	21900	12	7.7	21	33	1.5
Vinyl chloride	1.45	9.2			**22**	1.6	

VOCs (µg/L)	Recreational SSSL	ESV	CC-510-SW-06 4/21/2004 (RFI)	CC-510-SW-07 4/21/2004 (RFI)	CC-510-SW-08 9/28/2005 (RFI)	CC-510-SW-09 9/28/2005 (RFI)	CWM-183-SW/SD02 11/9/2001 (SI)
1,1,2,2-Tetrachloroethane	5.01	240		0.9 J	2.1	3.3	3.3
1,1-Dichloroethene	700	303					
Chloroform	147	289					
Cis-1,2-Dichloroethene	149	11600	0.3 J	0.23 J	0.29 J	0.71 J	1.4
Tetrachloroethene	1.48	84					
Toluene	2320	175					
Trans-1,2-Dichloroethene	287	1350					
Trichloroethene	74.5	21900	11	4.7	5.8	15	18
Vinyl chloride	1.45	9.2					

Notes:

ESV = Ecological Screening Value
µg/L = micrograms per liter
VOC = Volatile organic compound
RFI = 2004/2005 RCRA Facility Investigation
RI = 2003 Remedial Investigation (Shaw, 2004)
SI = Site Investigations for Parcel 183(6) (2001) and Parcel 510(7) (2003) (Shaw, 2004)
SSSL = Site-Specific Screening Level (most restrictive between cancer and non-cancer SSSL is shown)

J = Laboratory flag: Reported value is an estimated concentration.
(J) = Validation flag: Reported value is an estimated concentration.

Value exceeds Recreational SSSL.
Value exceeds ESV.

Table 5-13: Sediment Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Recreational SSSL	ESV	CC-510-SW/SD01 1/21/2003 (SI)	CC-510-SW/SD02 1/21/2003 (SI)	CC-510-SW/SD03 1/21/2003 (SI)	CC-510-SW/SD04 1/22/2003 (SI)	CC-510-SD-05 4/23/2004 (RFI)	CC-510-SD-06 4/23/2004 (RFI)	CWM-183-SW/SD02 11/9/2001 (SI)
VOCs (µg/kg)									
1,1,2,2-Tetrachloroethane	3.49E+05	940	4 J (J)	4.2 J (J)		11			1.3 J (J)
2-Butanone (MEK)	6.23E+08	137							16 J (J)
Acetone	9.24E+08	453			390 (J)	170 (J)			150
Carbon disulfide	1.04E+08	134			13 J (J)				
Chloroform	1.05E+07	27			3.2 J (J)				
Cis-1,2-Dichloroethene	1.05E+07	209			86	19	8.8		2.2 J (J)
p-Isopropyltoluene	2.08E+08	--			65				
sec-Butylbenzene	4.16E+07	--			13 J (J)				
Toluene	2.11E+08	670			6.6 J (J)				
Trichloroethene	5.60E+06	180	26	10	16	39	20	5.4 J	16
Vinyl chloride	1.03E+05	2.0			**57**		**17**		
SVOCs (µg/kg)									
Benzo(b)fluoranthene	8.93E+04	655			150 J (J)				
Bis(2-ethylhexyl)phthalate	5.41E+06	182			**280 J (J)**				

Notes:
ESV = Ecological Screening Value
µg/kg = micrograms per kilogram
SVOC = Semivolatile organic compound
VOC = Volatile organic compound
RFI = 2004/2005 RCRA Facility Investigation
SI = Site Investigations for Parcel 183(6) (2001) and Parcel 510(7) (2003) (Shaw, 2004)
SSSL = Site-Specific Screening Level (most restrictive between cancer and non-cancer SSSL is shown)

J = Laboratory flag: Reported value is an estimated concentration.
(J) = Validation flag: Reported value is an estimated concentration.

Value exceeds ESV.

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CC-510-DEP01 1/21/2003 (SI)	CC-510-MW01 10/30/2002 (SI)	CC-510-MW02 10/30/2002 (SI)	CC-510-MW03 10/30/2002 (SI)
VOCs (µg/kg)									
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	**160 (J)**			
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10	3.3 J (J)			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04	51		19 J (J)	
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05	57			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	670 (J)	150 (J)	270 (J)	180 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50	3.2 J (J)			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100				
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06	59			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1	**140 J (J)**			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100	40			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8				
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000	15 J (J)			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--				
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100				
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10	5.5 J (J)			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50				
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100	19			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**230**			
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100				
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50				
SVOCs (µg/kg)									
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000	130 J (J)			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--				
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5	**150 J (J)**			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2	**550 J (J)**			
Metals (mg/kg)									
Antimony	3.11	13.6	6.75	247	3.5				
Mercury	2.33	28.5	13.8	184	0.1				
Nickel	154	1450	697	1.20E+04	30				
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50	**5260 (J)**			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CC-510-MW04 10/30/2002 (SI)	CWM-183-DEP01 11/7/2001 (SI)	CWM-183-DEP02 11/7/2001 (SI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100			
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04		16 J (J)	66 (J)
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	57 (J)	160 (J)	710 J (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			7.4 J (J)
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			**150**
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			14
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1			
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-DEP03 1/23/2003 (RI)	CWM-183-DEP04 1/23/2003 (RI)	CWM-183-DEP05 1/22/2003 (RI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100			
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			26 J (J)
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	340 (J)	130 (J)	480 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1			
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-DEP06 1/22/2003 (RI)	CWM-183-DEP07 1/22/2003 (RI)	CWM-183-DEP08 1/23/2003 (RI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	9.8 J (J)		
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04	50		
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05	24 J (J)		
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	740 (J)	400 (J)	140 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--	7.1 J (J)	5.4 J (J)	
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50	5.8 J (J)		
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**6.3 J (J)**		
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50	2.2 J (J)		
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-GP01 11/17/2001 (SI)	CWM-183-GP02 11/17/2001 (SI)	CWM-183-GP04 12/2/2002 (RI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100		5.3	97
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04	11 J (J)		
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	130 (J)	28 (J)	56 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100		5.1	
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06		13	
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1		**120**	
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			1.2 J (J)
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1		**1.8 J (J)**	**31**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			1.9 J (J)
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-GP05 12/2/2002 (RI)	CWM-183-GP06 11/26/2002 (RI)	CWM-183-GP07 11/26/2002 (RI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	35	**320 E (J)**	
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04	16 J (J)		
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	150 (J)		
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06	3.8 J (J)	4 J (J)	
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1	**16**	**63**	
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8	5.3 J (J)		
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10	5.1 J (J)	2.9 J (J)	
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**84**	**72**	**1.7 J (J)**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5	***16.3***		
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50	**500**		

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-GP08 11/26/2002 (RI)	CWM-183-GP09 11/26/2002 (RI)	CWM-183-MW01 10/17/2001 (SI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	76	4.5 J (J)	
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			7.7 J (J)
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500			120 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10	**13**	1.4 J (J)	
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**95**	**11**	
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--	80 J (J)		
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW03 10/17/2001 (SI)	CWM-183-MW04 10/17/2001 (SI)	CWM-183-MW05 10/18/2001 (SI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	8.7	4.8	
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04	14 J (J)	7.8 J (J)	15 J (J)
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	160 (J)	140 (J)	350 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100		1.9 J (J)	
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10		1 J (J)	
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50	1.3 J (J)		7
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**20**	**2.4 J (J)**	
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW06 10/17/2001 (SI)	CWM-183-MW07 10/17/2001 (SI)	CWM-183-MW08 10/17/2001 (SI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	4.2 J (J)	9.4	48 (J)
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04	12 J (J)		12 J (J)
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	110 (J)	140 (J)	100 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			8.7
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			**200 (J)**
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			5.3 J (J)
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			1.2 J (J)
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1		**5.3**	**24 (J)**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30	**40.7**		
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW10 11/26/2001 (SI)	CWM-183-MW12 11/25/2002 (RI)	CWM-183-MW15 11/25/2002 (RI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100			
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	63 (J)	210 (J)	170 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1			
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW18 10/30/2002 (RI)	CWM-183-MW21 11/25/2002 (RI)	CWM-183-MW23 12/2/2002 (RI)
VOCs (µg/kg)								
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100			11
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	40 (J)	320 (J)	50 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1	**2.4 J (J)**		
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8			
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1			**6.1**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50			
SVOCs (µg/kg)								
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000			
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--			
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5			
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2			
Metals (mg/kg)								
Antimony	3.11	13.6	6.75	247	3.5			
Mercury	2.33	28.5	13.8	184	0.1			
Nickel	154	1450	697	1.20E+04	30			
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50			

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW24 10/31/2002 (RI)	CWM-183-SS03 9/27/2005 (RFI)
VOCs (µg/kg)							
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100		NA
1,3-Dichlorobenzene	2.33E+05	2.99E+06	1.46E+06	1.85E+07	10		NA
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04		NA
4-Methyl-2-pentanone	6.21E+05	8.11E+06	3.96E+06	4.94E+07	4.43E+05		NA
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	130 (J)	NA
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50		NA
Bromodichloromethane	1.02E+04	4.50E+04	5.50E+05	6.97E+05	100		NA
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06		NA
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1		NA
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100		NA
Hexachlorobutadiene	8070	3.58E+04	4.37E+05	5.54E+05	39.8		NA
Methylene chloride	84100	3.78E+05	2.98E+06	5.77E+06	2000		NA
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--		NA
Styrene	1.55E+06	2.01E+07	9.82E+06	1.24E+08	100		NA
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10		NA
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50		NA
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100		NA
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1		NA
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100		NA
Xylenes (total)	1.55E+06	1.78E+07	8.76E+06	1.24E+08	50		NA
SVOCs (µg/kg)							
2-Chloronaphthalene	6.22E+05	7.97E+06	3.91E+06	4.95E+07	1000		NA
Carbazole	3.11E+04	1.39E+05	1.67E+06	2.12E+06	--		NA
Hexachlorobenzene	393	1740	2.13E+04	2.70E+04	2.5		NA
Pentachlorophenol	5250	2.28E+04	2.80E+05	3.61E+05	2		NA
Metals (mg/kg)							
Antimony	3.11	13.6	6.75	247	3.5		
Mercury	2.33	28.5	13.8	184	0.1		**1.05**
Nickel	154	1450	697	1.20E+04	30		
Zinc	2340	2.83E+04	1.41E+04	1.88E+05	50		

Table 5-14: Surface and Depositional Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Notes:
-- = not applicable
ESV = Ecological Screening Value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = not analyzed
SVOC = Semivolatile organic compound
VOC = Volatile organic compound
RFI = 2004/2005 RCRA Facility Investigation
RI = 2003 Remedial Investigation (Shaw, 2004)
SI = Site Investigations for Parcel 183(6) (2001) and Parcel 510(7) (2003) (Shaw, 2004)
SSSL = Site-Specific Screening Level (most restrictive between cancer and non-cancer SSSL is shown)

Laboratory flags:
E = Above the calibration range of the instrument.
J = Reported value is an estimated concentration.
Validation flag:
(J) = Reported value is an estimated concentration.

Value exceeds the Residential SSSL.
Value exceeds the Groundskeeper and Construction Worker SSSLs.
Value exceeds ESV.

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CC-510-MW01 (4-6 ft) 10/30/2002 (SI)	CC-510-MW02 (4-6 ft) 10/30/2002 (SI)	CC-510-MW04 (10-12 ft) 10/30/2002 (SI)	CWM-183-GP01 (2-3 ft) 10/17/2001 (SI)
VOCs (µg/kg)									
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100				
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100				
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100				
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04				
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500				54 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50				
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06				
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1	**5.4 J (J)**			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100				
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000				
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--				
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10				
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50				
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100				
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1			**5.2 J (J)**	
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100	8.5			
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10				
SVOCs (µg/kg)									
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926				
CWM Breakdown (µg/kg)									
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--				
Metals (mg/kg)									
Cadmium	6.25	22.7	21.3	343	1.6		0.952 J (J)		

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-GP02 (9-10 ft) 10/17/2001 (SI)	CWM-183-GP04 (10-12 ft) 12/2/2002 (RI)	CWM-183-GP05 (11-12 ft) 12/2/2002 (RI)	CWM-183-GP06 (10-12 ft) 11/26/2002 (RI)
VOCs (µg/kg)									
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100				
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	**180**	**240 J (J)**	**300**	**3500**
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100				2.9 J (J)
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04				
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	7.7 J (J)			
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50				
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06				
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			**4.5 J (J)**	**7.8**
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100				
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000				
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--				
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10	6.1		7.2	8.1
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50				
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100				
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**42**	**40**		**1100**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100				
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10				
SVOCs (µg/kg)									
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926				
CWM Breakdown (µg/kg)									
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--				
Metals (mg/kg)									
Cadmium	6.25	22.7	21.3	343	1.6				

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-GP07 (10-12 ft) 11/26/2002 (RI)	CWM-183-GP08 (10-12 ft) 11/26/2002 (RI)	CWM-183-GP09 (10-12 ft) 11/26/2002 (RI)	CWM-183-MW01 (1-2 ft) 10/17/2001 (SI)
VOCs (µg/kg)									
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100				
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	**730**	**4300**	54 (J)	
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100	2.3 J (J)			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04				13 J (J)
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500				400 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			19	
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			4 J (J)	
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			**21**	
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100	1.1 J (J)	16	8.1	
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000				
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--				
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10		3.9 J (J)	1.5 J (J)	
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			3.9 J (J)	2.4 J (J)
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100		4.5 J (J)	2.5 J (J)	
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**22**	**41**	**23**	
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			8.7	
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10			**15**	
SVOCs (µg/kg)									
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926				
CWM Breakdown (µg/kg)									
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--				
Metals (mg/kg)									
Cadmium	6.25	22.7	21.3	343	1.6				

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW02 (1-2 ft) 10/17/2001 (SI)	CWM-183-MW03 (3-4 ft) 10/17/2001 (SI)	CWM-183-MW04 (5-6 ft) 10/17/2001 (SI)
VOCs (µg/kg)								
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100			
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100		4.1 J (J)	62
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	49 (J)	98 (J)	15 J (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1		**2 J (J)**	**3.4 J (J)**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10			
SVOCs (µg/kg)								
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926			
CWM Breakdown (µg/kg)								
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--			
Metals (mg/kg)								
Cadmium	6.25	22.7	21.3	343	1.6			

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW05 (2-3 ft) 10/18/2001 (SI)	CWM-183-MW06 (5-6 ft) 10/17/2001 (SI)	CWM-183-MW07 (2.3-3.3 ft) 10/17/2001 (SI)
VOCs (µg/kg)								
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100			
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100		5.2 J (J)	20
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	40 (J)	34 (J)	28 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--	1.4 J (J)		
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50	1.4 J (J)		
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1		**1.4 J (J)**	**3.3 J (J)**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100			2.6 J (J)
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10			
SVOCs (µg/kg)								
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926			
CWM Breakdown (µg/kg)								
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--			
Metals (mg/kg)								
Cadmium	6.25	22.7	21.3	343	1.6			

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW08 (9-10 ft) 10/17/2001 (SI)	CWM-183-MW09 (11-12 ft) 11/26/2001 (SI)	CWM-183-MW12 (10-12 ft) 11/25/2002 (RI)
VOCs (µg/kg)								
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100			
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100	13	17	
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100			
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04			
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500	12 J (J)		140 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50			
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06			
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1			
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100			
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000			
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--			
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10			
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50			
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100			
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1	**2.2 J (J)**	**9.6**	
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100	1.3 J (J)	1.2 J (J)	
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10			
SVOCs (µg/kg)								
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926			
CWM Breakdown (µg/kg)								
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--			
Metals (mg/kg)								
Cadmium	6.25	22.7	21.3	343	1.6			

Table 5-15: Subsurface Soil Contaminants Compared to SSSLs and ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Parameter Name	Residential SSSL	Grounds-keeper SSSL	Construction Worker SSSL	Recreational SSSL	ESV	CWM-183-MW18 (4-6 ft) 10/30/2002 (RI)	CWM-183-MW23 (10-12 ft) 12/4/2002 (RI)
VOCs (µg/kg)							
1,1,1,2-Tetrachloroethane	2.41E+04	1.07E+05	1.30E+06	1.65E+06	100		6 J (J)
1,1,2,2-Tetrachloroethane	3130	1.39E+04	1.69E+05	2.15E+05	100		***39000 (J)***
1,1,2-Trichloroethane	1.12E+04	4.92E+04	1.94E+05	7.76E+05	100		17 (J)
2-Butanone (MEK)	4.66E+06	6.05E+07	2.95E+07	3.70E+08	8.96E+04		
Acetone	6.99E+06	8.96E+07	4.37E+07	5.55E+08	2500		35 (J)
Benzene	1.15E+04	5.13E+04	1.97E+05	7.87E+05	50		
Carbon tetrachloride	4.83E+03	2.17E+04	3.38E+04	3.31E+05	1.00E+06		
Chloroform	7.77E+04	1.00E+06	4.91E+05	6.19E+06	1	**2.1 J (J)**	**28 (J)**
Cis-1,2-Dichloroethene	7.77E+04	9.97E+05	4.88E+05	6.19E+06	100		89 (J)
Methylene chloride	8.41E+04	3.78E+05	2.98E+06	5.77E+06	2000		
p-Isopropyltoluene	1.55E+06	2.03E+07	9.93E+06	1.23E+08	--		
Tetrachloroethene	1170	5270	6.45E+04	8.02E+04	10		**67 (J)**
Toluene	1.55E+06	2.03E+07	9.95E+06	1.24E+08	50		
Trans-1,2-Dichloroethene	1.55E+05	1.99E+06	9.77E+05	1.24E+07	100		2.5 J (J)
Trichloroethene	4.66E+04	2.17E+05	2.92E+05	3.32E+06	1		**3000 (J)**
Trichlorofluoromethane	2.33E+06	2.96E+07	1.44E+07	1.85E+08	100		
Vinyl chloride	876	3950	4.84E+04	6.02E+04	10		
SVOCs (µg/kg)							
Bis(2-Ethylhexyl)phthalate	4.52E+04	2.00E+05	9.82E+05	3.11E+06	926		130 J (J)
CWM Breakdown (µg/kg)							
Diisopropylmethylphos-phonic Acid	6.21E+05	8.13E+06	3.97E+06	4.94E+07	--		11 J (J)
Metals (mg/kg)							
Cadmium	6.25	22.7	21.3	343	1.6		

Notes:

ESV = Ecological Screening Value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
VOC = Volatile organic compound
RI = 2003 Remedial Investigation (Shaw, 2004).
SI = Site Investigations for Parcel 183(6) (2001) and Parcel 510(7) (2003) (Shaw, 2004)

SSSL = Site-Specific Screening Level (most restrictive between cancer and non-cancer SSSL is shown)
J = Laboratory flag: Reported value is an estimated concentration.
(J) = Validation flag: Reported value is an estimated concentration.

Value exceeds the Residential SSSL.
Value exceeds the Groundskeeper SSSL.
Value exceeds ESV.

Table 6-1: Summary of Anaerobic Degradation in Groundwater
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Selected Chlorinated Compounds Detected in Groundwater, 2001 - 2005			Evidence of Anaerobic Degradation		
	Chloroethane Pathway	Chloroethene Pathway	Chloromethane Pathway	Chloroethane Pathway	Chloroethene Pathway	Chloromethane Pathway
CC-510-MW02	1,1,2,2-PCA	TCE; cis-1,2-DCE; trans-1,2-DCE; vinyl chloride	none	No	Yes	No
CC-510-MW04	1,1,2,2-PCA	PCE; TCE; cis-1,2-DCE	chloroform	No	Yes	No
CWM-183-MW04	1,1,2,2-PCA; 1,1,2-TCA; 1,2-DCA	PCE; TCE; cis-1,2-DCE; trans-1,2-DCE; 1,1-DCE; vinyl chloride	none	Yes	Yes	No
CWM-183-MW06	1,1,2,2-PCA	PCE; TCE; cis-1,2-DCE	carbon tet; chloroform	No	Yes	No
CWM-183-MW10	none	TCE	none	No	No	No
CWM-183-MW11	1,1,2,2-PCA; 1,1,2-TCA	PCE; TCE; cis-1,2-DCE; trans-1,2-DCE; 1,1-DCE	chloroform	Yes	Yes	No
CWM-183-MW12	1,1,2,2-PCA	TCE	chloroform	No	No	No
CWM-183-MW13	1,1,2,2-PCA; 1,1,2-TCA	PCE; TCE; cis-1,2-DCE; trans-1,2-DCE; 1,1-DCE	chloroform	Yes	Yes	No
CWM-183-MW14	1,1,2,2-PCA	PCE; TCE; cis-1,2-DCE	chloroform	No	Yes	No
CWM-183-MW21	1,1,2,2-PCA; 1,1,2-TCA	PCE; TCE; cis-1,2-DCE; trans-1,2-DCE; 1,1-DCE; vinyl chloride	chloroform	Yes	Yes	No
CWM-183-MW22	1,1,2,2-PCA; 1,1,2-TCA	PCE; TCE; cis-1,2-DCE; trans-1,2-DCE; 1,1-DCE; vinyl chloride	chloroform	Yes	Yes	No
CWM-183-MW23	1,1,2,2-PCA; 1,1,2-TCA	PCE; TCE; cis-1,2-DCE; trans-1,2-DCE; 1,1-DCE	chloroform	Yes	Yes	No
CWM-183-MW27	1,1,2,2-PCA	PCE; TCE; cis-1,2-DCE; 1,1-DCE	chloroform	No	Yes	No
CWM-183-MW28	none	TCE	chloroform	No	No	No

Table 6-1: Summary of Anaerobic Degradation in Groundwater
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Well Location	Selected Chlorinated Compounds Detected in Groundwater, 2001 - 2005			Evidence of Anaerobic Degradation		
	Chloroethane Pathway	Chloroethene Pathway	Chloromethane Pathway	Chloroethane Pathway	Chloroethene Pathway	Chloromethane Pathway
CWM-183-MW29	1,1,2,2-PCA	PCE; TCE; cis-1,2-DCE; 1,1-DCE	chloroform	No	Yes	No

Notes:

Four-chlorine compounds:
1,1,2,2-PCA = 1,1,2,2 tetrachloroethane
PCE = tetrachloroethene
carbon tet = carbon tetrachloride

Three-chlorine compounds:
1,1,2-TCA = 1,1,2 trichloroethane
TCE = trichloroethene
chloroform

Two-chlorine compounds:
1,2-DCA = 1,2 dichloroethane
cis-1,2-DCE = cis-1,2-dichloroethane
trans-1,2-DCE = trans-1,2-dichloroethane
1,1-DCE = 1,1 dichloroethene
methylene chloride

Single-chlorine compounds:
chloroethane
vinyl chloride
chloromethane

Table 7-1: Human Receptor Exposure Route Scenarios
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Source Medium	Exposure Medium	Method of Transport	Exposure Route
Groundwater	Drinking Water	NA	Consumption Dermal contact
	Air	Volatilization	Inhalation
Surface Water	Surface Water	NA	Incidental ingestion Dermal contact
Sediment	Sediment	NA	Incidental ingestion Dermal contact
Surface Soil	Soil	NA	Incidental ingestion Dermal contact
	Air	Dust emissions	Inhalation
	Vegetation/ Game Animals	Biotransfer	Consumption
Total Soil*	Soil	NA	Incidental ingestion Dermal contact
	Air	Dust emissions	Inhalation

Notes:

NA = not applicable

* Includes surface and subsurface soil, assuming the potential for construction, excavation, or grading at the Site, which may bring subsurface soil to the surface.

Table 7-2: Summary of Constituents of Potential Concern Exceeding SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Groundwater COPCs	CC-510-MW02 (residuum)	CC-510-MW04 (residuum)	CWM-183-MW04 (residuum)	CWM-183-MW06 (residuum)	CWM-183-MW07 (residuum)	CWM-183-MW08 (residuum)	CWM-183-MW09 (residuum)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane					2.2		
1,1,2,2-Tetrachloroethane		3.3	0.69 J	32	8600	75	390
1,1,2-Trichloroethane					64		1.4
1,2-Dichloroethane			0.59 J		0.49 J (J)		
Acetone							
Bromodichloromethane				1.5	1.1		
Chloroform				1100 (JA)	140		
Cis-1,2-Dichloroethene					180		
Tetrachloroethene		0.42 J		0.76 J	57	2.3	7.1
Trans-1,2-Dichloroethene					42		
Trichloroethene		71	8.5	35	5500	150	510
Vinyl chloride	0.38 J		1.7		1.2		
Metals (mg/L)							
Nickel				0.137			
Thallium		0.0054 J (J)					

Groundwater COPCs	CWM-183-MW12 (residuum)	CWM-183-MW14 (residuum)	CWM-183-MW15 (residuum)	CWM-183-MW21 (residuum)	CWM-183-MW23 (residuum)	CWM-183-MW11 (bedrock)	CWM-183-MW13 (bedrock)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane					4.4		
1,1,2,2-Tetrachloroethane	4			2.9	12000	0.37 J	9
1,1,2-Trichloroethane				1.6	6.7		
1,2-Dichloroethane							
Acetone							
Bromodichloromethane							
Chloroform					22		
Cis-1,2-Dichloroethene				40	49		
Tetrachloroethene				3.3	110 (JS)	0.93 J	1.2
Trans-1,2-Dichloroethene							
Trichloroethene		21	25	430	3600 (JS)	83	120
Vinyl chloride							
Metals (mg/L)							
Nickel							
Thallium							

Table 7-2: Summary of Constituents of Potential Concern Exceeding SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Groundwater COPCs	CWM-183-MW16 (bedrock)	CWM-183-MW17 (bedrock)	CWM-183-MW20 (bedrock)	CWM-183-MW22 (bedrock)	CWM-183-MW27 (bedrock)	CWM-183-MW29 (bedrock)	CWM-183-MW30 (bedrock)
VOCs (µg/L)							
1,1,1,2-Tetrachloroethane							
1,1,2,2-Tetrachloroethane			18		0.46 J	10	
1,1,2-Trichloroethane			2.4				
1,2-Dichloroethane							
Acetone							1500 (JA)
Bromodichloromethane							
Chloroform							
Cis-1,2-Dichloroethene				35			
Tetrachloroethene	0.53 J	0.3 J	28	1.2	1.3	0.71 J	
Trans-1,2-Dichloroethene							
Trichloroethene	170	71	3700	170	88	61	
Vinyl chloride							
Metals (mg/L)							
Nickel							
Thallium							

Surface Water COPCs	CC-510-SW/SD03	CC-510-SW/SD04
VOCs (µg/L)		
1,1,2,2-Tetrachloroethane		6.5
Vinyl chloride	22	1.6

Surface/Depositional Soil COPCs	CC-510-DEP01	CWM-183-GP05
Metals (mg/kg)		
Antimony		16.3
Zinc	5260 (J)	

Subsurface Soil COPCs	CWM-183-GP06 (10-12 ft)	CWM-183-GP08 (10-12 ft)	CWM-183-MW23 (10-12 ft)
VOCs (µg/kg)			
1,1,2,2-Tetrachloroethane	3500	4300	39000 (J)

Table 7-2: Summary of Constituents of Potential Concern Exceeding SSSLs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
COPC = Constituent of potential concern
ft = feet
SSSL = Site-Specific Screening Level
VOC = Volatile organic compound

Laboratory flag:
J = Reported value is an estimated concentration.
Validation flags:
(J) = Reported value is an estimated concentration.
(JA) = Estimated detection; internal standard was outside method-specific criteria.
(JS) = Estimated detection; surrogate recovery was outside laboratory control limits.

Table 7-3: Comparison of EPCs to Cancer and Non-Cancer SSSLs for Constituents of Potential Concern in Groundwater
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

		Residential SSSL				Groundskeeper SSSL				Construction Worker SSSL			
COPC	EPC (MDC)	cancer	EPC > SSSL	non-cancer	EPC > SSSL	cancer	EPC > SSSL	non-cancer	EPC > SSSL	cancer	EPC > SSSL	non-cancer	EPC > SSSL
VOCs (µg/L)													
1,1,1,2-Tetrachloroethane	4.4	1.57	Yes	45.6	No	10.2	No	283	No	254	No	7080	No
1,1,2,2-Tetrachloroethane	12000	0.203	Yes	90.2	Yes	1.36	Yes	582	Yes	34	Yes	14600	No
1,1,2-Trichloroethane	64	0.72	Yes	6.18	Yes	5.02	Yes	39.5	Yes	126	No	988	No
1,2-Dichloroethane	0.59	0.448	Yes	46.6	No	3.08	No	300	No	76.9	No	7500	No
Acetone	1500	--	--	1410	Yes	--	--	9170	No	--	--	229000	No
Bromodichloromethane	1.5	0.653	Yes	31	No	4.5	No	199	No	112	No	4980	No
Chloroform	1100	--	--	15.4	Yes	--	--	98.6	Yes	--	--	2470	No
Cis-1,2-Dichloroethene	180	--	--	15.5	Yes	--	--	99.1	Yes	--	--	2480	No
Tetrachloroethene	110	0.121	Yes	14.6	Yes	0.443	Yes	85.4	Yes	11.1	Yes	2130	No
Trans-1,2-Dichloroethene	42	--	--	30.7	Yes	--	--	195	No	--	--	4860	No
Trichloroethene	5500	3.83	Yes	9.15	Yes	20.5	Yes	57.2	Yes	513	Yes	1430	Yes
Vinyl Chloride	1.7	0.0918	Yes	4.64	No	0.386	Yes	29.8	No	9.65	No	744	No
Metals (mg/L)													
Nickel	0.137	--	--	0.0313	Yes	--	--	0.202	No	--	--	5.06	No
Thallium	0.0054	--	--	0.00011	Yes	--	--	0.000712	Yes	--	--	0.0178	No

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
COPC = Constituent of potential concern
EPC = Exposure point concentration
MDC = Maximum Detected Concentration
SSSL = Site-Specific Screening Level
VOC = Volatile organic compound
-- = Not applicable

Table 7-4: Comparison of EPCs to Cancer and Non-Cancer SSSLs for Constituents of Potential Concern in Surface Water
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

				Recreational SSSL			
COPC	**MDC**	**95% UCL**	**EPC**	**cancer**	**EPC > SSSL**	**non-cancer**	**EPC > SSSL**
VOCs (µg/L)							
1,1,2,2-Tetrachloroethane	6.5	3.22	3.22	5.01	No	859	No
Vinyl chloride	22	20.1	20.1	1.45	Yes	44.8	No

Notes:
% = percent
µg/L = micrograms per liter
COPC = Constituent of potential concern
EPC = Exposure point concentration (the lesser value of the 95% UCL or MDC)
MDC = Maximum Detected Concentration
SSSL = Site-Specific Screening Level
UCL = Upper confidence limit
VOC = Volatile organic compound

Table 7-5: Comparison of EPCs to Cancer and Non-Cancer SSSLs for Constituents of Potential Concern in Soil
Training Area T-6 and Cane Creek Training Area
McClellan, Anniston, Alabama

				Residential SSSL				Groundskeeper SSSL			
COPCs	MDC	95% UCL	EPC	cancer	EPC > SSSL	non-cancer	EPC > SSSL	cancer	EPC > SSSL	non-cancer	EPC > SSSL
Surface/Depositional Soil:											
Metals (mg/kg)											
Antimony	16.3	5.66	5.66	--	--	3.11	Yes	--	--	13.6	No
Zinc	5260	665	665	--	--	2340	No	--	--	28300	No
Subsurface Soil:											
VOCs (µg/kg)											
1,1,2,2-Tetrachloroethane	39000	14567	14567	3130	Yes	465000	No	13900	Yes	5920000	No

				Construction Worker SSSL				Recreational SSSL			
COPCs	MDC	95% UCL	EPC	cancer	EPC > SSSL	non-cancer	EPC > SSSL	cancer	EPC > SSSL	non-cancer	EPC > SSSL
Surface/Depositional Soil:											
Metals (mg/kg)											
Antimony	16.3	5.66	5.66	--	--	6.75	No	--	--	247	No
Zinc	5260	665	665	--	--	14100	No	--	--	188000	No
Subsurface Soil:											
VOCs (µg/kg)											
1,1,2,2-Tetrachloroethane	39000	14567	14567	169000	No	2880000	No	215000	No	36800000	No

Notes:

% = percent
-- = Not applicable
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram
COPC = Constituent of potential concern
EPC = Exposure point concentration (the lesser value of the 95% UCL or MDC)
MDC = Maximum Detected Concentration
SSSL = Site-Specific Screening Level
UCL = Upper confidence limit
VOC = Volatile organic compound

Table 7-6: Summary of Constituents of Concern
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

COCs	Cancer Risk	Non-Cancer Hazard
Groundwater		
1,1,1,2-Tetrachloroethane	X	
1,1,2,2-Tetrachloroethane	X	X
1,1,2-Trichloroethane	X	X
1,2-Dichloroethane	X	
Acetone		X
Bromodichloromethane	X	
Chloroform		X
Cis-1,2-Dichloroethene		X
Tetrachloroethene	X	X
Trans-1,2-Dichloroethene		X
Trichloroethene	X	X
Vinyl Chloride	X	
Nickel		X
Thallium		X
Surface Water		
Vinyl Chloride	X	
Surface/Depositional Soil		
Antimony		X

Notes:
COC = Constituent of concern

Table 7-7: Cancer Risk and Non-Cancer Hazard Measurements for Residents Exposed to Groundwater
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

		Resident	
COC	**EPC**	**cancer ILCR**	**noncancer HI**
VOCs (µg/L)			
1,1,1,2-Tetrachloroethane	4.4	2.80E-06	--
1,1,2,2-Tetrachloroethane	12000	5.91E-02	13.3
1,1,2-Trichloroethane	64	8.89E-05	1.04
1,2-Dichloroethane	0.59	1.32E-06	--
Acetone	1500	--	0.106
Bromodichloromethane	1.5	2.30E-06	--
Chloroform	1100	--	7.1
Cis-1,2-Dichloroethene	180	--	1.16
Tetrachloroethene	110	9.09E-04	0.75
Trans-1,2-Dichloroethene	42	--	0.137
Trichloroethene	5500	1.44E-03	60
Vinyl Chloride	1.7	1.85E-05	--
Metals (mg/L)			
Nickel	0.137	--	0.44
Thallium	0.0054	--	4.91
Total ILCR / HI		**6.16E-02**	**89**

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
COC = Constituent of concern
EPC = Exposure point concentration
HI = Hazard index
ILCR = Incremental lifetime cancer risk
VOC = Volatile organic compound
-- = Not applicable

Table 7-8: Cancer Risk and Non-Cancer Hazard Measurements for Recreational Users Exposed to Surface Water
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

		Recreational	
COC	**EPC**	**cancer ILCR**	**non-cancer HI**
VOCs (µg/L)			
Vinyl chloride	20.1	1.39E-05	--
Total ILCR / HI		**1.39E-05**	**--**

Notes:
µg/L = micrograms per liter
COC = Constituent of concern
EPC = Exposure point concentration
HI = Hazard index
ILCR = Incremental lifetime cancer risk
VOC = Volatile organic compound
-- = Not applicable

Table 7-9: Cancer Risk and Non-Cancer Hazard Measurements for Residents Exposed to Soil
Training Area T-6 and Cane Creek Training Area
McClellan, Anniston, Alabama

		Resident	
COC	**EPC**	**cancer ILCR**	**noncancer HI**
Surface/Depositional Soil:			
Metals (mg/kg)			
Antimony	5.66	--	0.18
Total ILCR / HI		**--**	**0.18**

Notes:
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
COC = Constituent of concern
EPC = Exposure point concentration
HI = Hazard index
ILCR = Incremental lifetime cancer risk
VOC = Volatile organic compound
-- = Not applicable

Table 7-10: Separation of Non-Cancer Hazard by Target Organ for Residents Exposed to Groundwater
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

		Resident Target Organ Hazard							
COC	**EPC**	**Lung**	**Liver**	**Kidney**	**Erythrocyte**	**CNS**	**Skin**	**Immune System**	**Nasal Epithelium**
VOCs (µg/L)									
1,1,2,2-Tetrachloroethane	12000	--	13.3	--	--	--	--	--	--
1,1,2-Trichloroethane	64	--	--	--	--	--	--	1.04	--
Acetone	1500	--	0.106	0.106	--	--	--	--	--
Chloroform	1100	--	7.1	7.1	--	--	--	--	7.1
Cis-1,2-Dichloroethene	180	--	--	--	1.16	--	--	--	--
Tetrachloroethene	110	--	0.75	0.75	--	0.75	--	--	--
Trans-1,2-Dichloroethene	42	--	0.137	--	--	--	--	--	--
Trichloroethene	5500	--	60	60	--	--	--	--	--
Metals (mg/L)									
Nickel	0.137	0.44	--	--	--	--	--	--	--
Thallium	0.0054	--	4.91	--	--	4.91	4.91	--	--
Total HI		**0.44**	**86**	**68**	**1.16**	**5.66**	**4.91**	**1.04**	**7.1**

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
COC = Constituent of concern
CNS = central nervous system
EPC = Exposure point concentration
HI = Hazard index
VOC = Volatile organic compound
-- = Not applicable

Table 7-11: Separation of Non-Cancer Hazard by Target Organ for the Resident Exposed to Surface and Depositional Soil
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

		Resident Target Organ Hazard								
COC	**EPC**	**Lung**	**Liver**	**Heart**	**Kidney**	**Erythrocyte**	**CNS**	**Skin**	**Immune System**	**Nasal Epithelium**
Metals (mg/L)										
Antimony	5.66	--	--	0.18	--	--	--	--	--	--
Total HI		**--**	**--**	**0.18**	**--**	**--**	**--**	**--**	**--**	**--**

Notes:
mg/L = milligrams per liter
COC = Constituent of concern
CNS = central nervous system
EPC = Exposure point concentration
HI = Hazard index
-- = Not applicable

Table 8-1: Summary of Constituents of Potential Concern Exceeding ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Surface Water COPC	CC-510-SW/SD03
VOCs (µg/L)	
Vinyl chloride	22

Sediment COPCs	CC-510-SW/SD03	CC-510-SD-05
VOCs (µg/kg)		
Vinyl chloride	57	17
SVOCs (µg/kg)		
Bis(2-ethylhexyl)phthalate	280 J (J)	

Surface and Depositional Soil COPCs	CC-510-DEP01	CWM-183-DEP02	CWM-183-DEP06	CWM-183-GP02	CWM-183-GP04	CWM-183-GP05
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane	160 (J)					
Chloroform	140 J (J)			120		16
Styrene		150				
Tetrachloroethene						
Trichloroethene	230		6.3 J (J)	1.8 J (J)	31	84
SVOCs (µg/kg)						
Hexachlorobenzene	150 J (J)					
Pentachlorophenol	550 J (J)					
Metals (mg/kg)						
Antimony						16.3
Mercury						
Nickel						
Zinc	5260 (J)					500

Table 8-1: Summary of Constituents of Potential Concern Exceeding ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Surface and Depositional Soil COPCs	CWM-183-GP06	CWM-183-GP07	CWM-183-GP08	CWM-183-GP09	CWM-183-MW03	CWM-183-MW04
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane	320 E (J)					
Chloroform	63					
Styrene						
Tetrachloroethene			13			
Trichloroethene	72	1.7 J (J)	95	11	20	2.4 J (J)
SVOCs (µg/kg)						
Hexachlorobenzene						
Pentachlorophenol						
Metals (mg/kg)						
Antimony						
Mercury						
Nickel						
Zinc						

Surface and Depositional Soil COPCs	CWM-183-MW06	CWM-183-MW07	CWM-183-MW08	CWM-183-MW18	CWM-183-MW23	CWM-183-SS03
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane						NA
Chloroform			200 (J)	2.4 J (J)		NA
Styrene						NA
Tetrachloroethene						NA
Trichloroethene		5.3	24 (J)		6.1	NA
SVOCs (µg/kg)						
Hexachlorobenzene						NA
Pentachlorophenol						NA
Metals (mg/kg)						
Antimony						
Mercury						1.05
Nickel	40.7					
Zinc						

Table 8-1: Summary of Constituents of Potential Concern Exceeding ESVs
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

Subsurface Soil COPCs	CC-510-MW01 (4-6 ft)	CC-510-MW04 (10-12 ft)	CWM-183-GP02 (9-10 ft)	CWM-183-GP04 (10-12 ft)	CWM-183-GP05 (11-12 ft)	CWM-183-GP06 (10-12 ft)
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane			180	240 J (J)	300	3500
Chloroform	5.4 J (J)				4.5 J (J)	7.8
Tetrachloroethene						
Trichloroethene		5.2 J (J)	42	40		1100
Vinyl chloride						

Subsurface Soil COPCs	CWM-183-GP07 (10-12 ft)	CWM-183-GP08 (10-12 ft)	CWM-183-GP09 (10-12 ft)	CWM-183-MW03 (3-4 ft)	CWM-183-MW04 (5-6 ft)	CWM-183-MW06 (5-6 ft)
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane	730	4300				
Chloroform			21			
Tetrachloroethene						
Trichloroethene	22	41	23	2 J (J)	3.4 J (J)	1.4 J (J)
Vinyl chloride			15			

Subsurface Soil COPCs	CWM-183-MW07 (2.3-3.3 ft)	CWM-183-MW08 (9-10 ft)	CWM-183-MW09 (11-12 ft)	CWM-183-MW18 (4-6 ft)	CWM-183-MW23 (10-12 ft)
VOCs (µg/kg)					
1,1,2,2-Tetrachloroethane					39000 (J)
Chloroform				2.1 J (J)	28 (J)
Tetrachloroethene					67 (J)
Trichloroethene	3.3 J (J)	2.2 J (J)	9.6		3000 (J)
Vinyl chloride					

Notes:
COPC = Constituent of potential concern
ESV = Ecological Screening Value
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
SVOC = Semivolatile organic compound
VOC = Volatile organic compound
NA = not analyzed

Laboratory flag:
J = Reported value is an estimated concentration.
E = Above the calibration range of the instrument.
Validation flag:
(J) = Reported value is an estimated concentration.

Table 8-2: Constituents of Ecological Concern
Training Area T-6, Parcel 183(6) and Cane Creek Training Area, Parcel 510(7)
McClellan, Anniston, Alabama

COPCs	MDC	95% UCL	EPC	ESV	HQ	COC (HQ>1)
Surface Water:						
VOCs (µg/L)						
Vinyl chloride	22	20.1	20.1	9.2	2.2	Yes
Sediment:						
VOCs (µg/kg)						
Vinyl chloride	57	53.9	53.9	2.0	27	Yes
SVOCs (µg/kg)						
Bis(2-ethylhexyl)phthalate	280	257	257	182	1.4	Yes
Surface/Depositional Soil:						
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane	320	111	111	100	1.1	Yes
Chloroform	200	80.8	80.8	1	81	Yes
Styrene	150	20.6	20.6	100	0.21	No
Tetrachloroethene	13	2.68	2.68	10	0.27	No
Trichloroethene	230	80.4	80.4	1	80	Yes
SVOCs (µg/kg)						
hexachlorobenzene	150	73.6	73.6	2.5	29	Yes
pentachlorophenol	550	124	124	2	62	Yes
Metals (mg/kg)						
Antimony	16.3	5.66	5.66	3.5	1.6	Yes
Mercury	1.05	0.16	0.16	0.1	1.6	Yes
Nickel	40.7	15.7	15.7	30	0.52	No
Zinc	5260	665	665	50	13	Yes
Subsurface Soil:						
VOCs (µg/kg)						
1,1,2,2-Tetrachloroethane	39000	14567	14567	100	146	Yes
Chloroform	28	14.0	14.0	1	14	Yes
Tetrachloroethene	67	25.6	25.6	10	2.6	Yes
Trichloroethene	3000	1189	1189	1	1189	Yes
Vinyl chloride	15	3.72	3.72	10	0.37	No

Notes:
% = percent
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
COC = Constituent of concern
EPC = Exposure point concentration
ESV = Ecological Screening Value
HQ = Hazard quotient
MDC = Maximum Detected Concentration
SVOCs = Semivolatile organic compounds
UCL = Upper confidence limit
VOCs = Volatile organic compounds