Corrective Measures Effectiveness Report
January 2022 Monitoring Event
Former Chemical Laundry and
Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Prepared for:

McClellan Development Authority

Prepared by:

Matrix

283 Rucker Street, Bldg. 3165
Anniston, Alabama 36205
(256) 847-0780
Fax (256) 847-0905

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LIST OF ACRONYMS

ADEM	Alabama Department of Environmental Management
ARBCA	*Alabama Risk-Based Corrective Action Guidance Manual, Revision 3*
Army	United States Department of the Army
cis-1,2-DCE	cis-1,2-dichloroethene
CMER	Corrective Measures Effectiveness Report
CMIP	*Final Corrective Measures Implementation Plan, Chemical Laundry and Motor Pool Area 1500, Parcel 94(7) McClellan, Anniston, Alabama*
COC	Constituent of concern
DO	Dissolved oxygen
DQS	Data Quality Summary
EBS	*Environmental Baseline Study*
EPA	United States Environmental Protection Agency
ESE	Environmental Science & Engineering, Inc.
FFS	*Focused Feasibility Study*
ft/ft	Feet per foot
IT	IT Corporation
LTM	Long-term monitoring
LUC	Land use control
McClellan	Former Fort McClellan
MCL	Maximum contaminant level
MDA	McClellan Development Authority
MES	Matrix Environmental Services, LLC
μg/L	Micrograms per liter
MNA	Monitored natural attenuation
ORP	Oxidation-reduction potential
QAP	*Quality Assurance Plan*
QA	Quality assurance
QC	Quality control
RI	*Remedial Investigation*
RSL	Regional Screening Level
SAIC	Science Applications International Corporation
SAP	*Final Installation-Wide Sampling and Analysis Plan*
SI	*Site Investigation*
Site	Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
TCE	Trichloroethene
TDS	Total dissolved solids
TKN	Total Kjeldahl nitrogen
trans-1,2-DCE	trans-1,2-dichloroethene
UST	Underground storage tank
VOC	Volatile organic compound

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EXECUTIVE SUMMARY

The purpose of this Corrective Measures Effectiveness Report (CMER) is to document the progress of achieving the remedial objectives for contaminated groundwater at the Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7) (Site), located at the former Fort McClellan (McClellan) in Anniston, Alabama, during the Long-Term Monitoring (LTM) sample event conducted in January 2022. This report was prepared by Matrix Environmental Services, LLC (MES) on behalf of the McClellan Development Authority (MDA).

During the January 2022 groundwater monitoring event, groundwater samples were collected from one residuum well and five bedrock wells and analyzed for volatile organic compounds (VOCs). Groundwater samples from bedrock well FTA-94-MW11 were also analyzed for monitored natural attenuation (MNA) parameters light hydrocarbons, total and dissolved iron and manganese, ammonia, nitrate, nitrite, sulfate, and total Kjeldahl nitrogen (TKN). The groundwater analytical results for the Site-specific constituents of concern (COCs) chlorobenzene, trichloroethene (TCE), and vinyl chloride, and TCE degradation products cis-1,2-dichloroethene (cis-1,2-DCE) and trans-1,2-dichloroethene (trans-1,2-DCE) were compared to the Maximum Contaminant Levels (MCLs).

The concentrations of COCs in bedrock monitoring well FTA-94-MW11 continue to fluctuate over time, with TCE and vinyl chloride at levels greater than the MCLs in January 2022. None of the degradation product concentrations in the bedrock monitoring wells exceeded the MCLs during the January 2022 sampling event. The presence of methane and the low concentrations of electron acceptor sulfate indicate that reducing conditions are present for biologically mediated reductive dehalogenation of chlorinated solvents. The low magnitudes of the horizontal hydraulics gradients indicate limited groundwater movement at the Site.

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1.0 INTRODUCTION

The purpose of this Corrective Measures Effectiveness Report (CMER) is to document the progress of achieving the remedial action objectives for contaminated groundwater at the Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7) (Site), located at the former Fort McClellan (McClellan) in Anniston, Alabama, during the Long-Term Monitoring (LTM) sample event conducted in January 2022. Figure 1-1 shows a site map of McClellan and Figure 1-2 shows a parcel location map of the Site. This report was prepared by Matrix Environmental Services, LLC (MES) on behalf of the McClellan Development Authority (MDA).

1.1 Report Purpose and Objectives

This CMER summarizes groundwater monitoring data collected at the Site during the January 2022 monitoring event, as per the *Final Corrective Measures Implementation Plan, Chemical Laundry and Motor Pool Area 1500, Parcel 94(7) McClellan, Anniston, Alabama (CMIP)* (MES, 2006 [Revised 2015]). Objectives for the January 2022 monitoring event and this CMER include:

- Describe the activities performed at the Site during the January 2022 monitoring event.
- Summarize environmental sampling data from previous investigations and monitoring events and present analytical results for the January 2022 monitoring event.
- Compare the current results of the groundwater samples to historical groundwater results.
- Compare the analytical results for the constituents of concern and their degradation products to the Maximum Contaminant Levels (MCLs) to assess the progress of natural attenuation at the Site.

1.2 Report Organization

This CMER is organized as follows:

- Section 1.0 - summarizes the project background, purpose of the CMER, and report organization.
- Section 2.0 - presents a summary of the Site characterization, corrective measures, and previous environmental investigations and monitoring events.
- Section 3.0 - describes the activities conducted during the January 2022 monitoring event.
- Section 4.0 - presents the results of the January 2022 monitoring event.
- Section 5.0 - presents the summary, conclusions, and recommendations.
- Section 6.0 - provides the references cited in this report.
- Tables that support the CMER.
- Figures that support the CMER.
- Appendix A contains the Groundwater Levels and Sample Collection Logs.
- Appendix B contains the Chain-of-Custody Forms.
- Appendix C contains the Data Quality Summary.
- Appendix D contains the Historical Analytical Data for Detected VOCs in Groundwater Compared to MCLs.

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2.0 SITE CHARACTERIZATION

This section summarizes the Site description and physical setting, land use, previous investigations conducted at the Site, and corrective measures.

2.1 Site Description and Physical Setting

The Site is located in the central area of McClellan, along Langley Avenue and south of St. Clair Road (Figure 1-2). The Site was formerly used as a vehicle maintenance facility, including three gas stations, and garment impregnation facilities. The garment impregnation facilities reportedly laundered garments to neutralize chemical warfare material (CWM). The garments were also treated to render them relatively impermeable to CWM. The impregnation plants reportedly used large volumes of toluene or ethyl alcohol, and possibly wax and “chlorinated oil”. The buildings at the Site have been demolished. Two concrete slab foundations remain at the Site along with concrete sumps or grease pits. The remainder of the Site is covered with asphalt pavement.

The lithologic sequence encountered at the Site consists of an upper interval of residuum 6 to 50 feet thick overlying fractured, weathered limestone. Bedrock at the Site has been mapped as Ordovician-age Little Oak and Newala Limestones, undifferentiated, and Mississippian/ Ordovician-age Floyd and Athens Shale, undifferentiated. An asymmetric anticlinal fold strikes northeast across the parcel and plunges to the southwest (Figure 2-1).

Soil at the Site has been mapped as Anniston and Allen series and the Philo series. Anniston and Allen gravelly loams consist of strongly acid, deep well-drained friable soils. Along the bank of Ingram Creek, the soil is classified as the Philo and Stendal fine sandy loams. The Philo series consist of strongly acid, moderately well-drained soil that is developing in local and general alluvium.

Groundwater flow in the residuum generally conforms to surface topography and flows predominately to the northeast towards Ingram Creek. Groundwater flow in the bedrock appears to be structurally controlled following the general trend of the underlying limestone and flowing away from the inferred location of the anticlinal fold hinge.

The history, geology, soil, and hydrogeology of the Site is described in greater detail in the *Draft Remedial Investigation Report, Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)* by IT Corporation (IT) (2002).

2.2 Land Use and Land Use Controls

The proposed future land use for the Site is a technology and research park, as proposed in the Re-Use Plan (EDAW Inc., 1997, amended by the JPA in June 2005). Current land use controls (LUCs) at the Site include a restriction on the consumptive or other use of groundwater and direct contact with groundwater below the Site, unless proper safety and disposal measures as approved by the Alabama Department of Environmental Management (ADEM), are implemented (United States Department of the Army [Army], 2003). Environmental Covenant Number FY-12-08.00 for the Site, submitted to ADEM by the MDA in accordance with the Alabama Uniform Environmental Covenants Act, Code of Alabama §§ 35-19-1 through 35-19-

14, was filed in Probate on August 13, 2014. The covenant describes restrictions within the covenant boundary that does not include the boundary area of Parcel 94(7). The covenant boundary is located downgradient of the Parcel 94(7) boundary where concentrations of COCs were detected in groundwater.

2.3 Summary of Previous Investigations

Previous investigations conducted at the Site include:

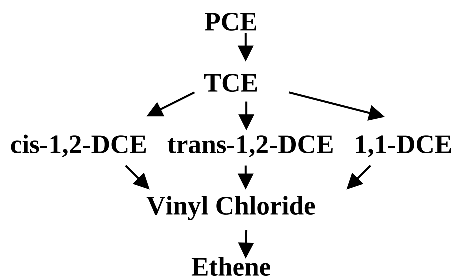
- *Environmental Baseline Study* (*EBS*) (Environmental Science & Engineering, Inc. [ESE], 1998) and *Site Investigation* (*SI)* (Science Applications International Corporation [SAIC], 1993): An *EBS* was conducted to document current environmental conditions of the Fort McClellan property (ESE, 1998). Subsequently an *SI* was completed in 1998, which included a geophysical investigation to identify potential underground storage tanks (USTs). No USTs were found at the Site (SAIC, 1993).
- *Remedial Investigation (RI)* (IT, 2002): A *RI* was performed in two phases and chlorinated solvents were detected in groundwater collected from residuum and bedrock monitoring wells. Based on the *RI* sample collection, VOCs in groundwater appeared to be centered in the vicinity of residuum well FTA-94-MW01 and bedrock well FTA-94-MW11. The occurrence of vinyl chloride, cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE), degradation products of trichloroethene (TCE), was generally restricted to these two monitoring wells. During the *RI*, TCE and vinyl chloride were identified as constituents of concern (COCs) at the Site (IT, 2002).
- *Focused Feasibility Study* (*FFS*) (IT, 2003): IT conducted a *FFS* based on information collected during the *RI*, including a streamlined human health risk assessment based on a residential exposure scenario. The *FFS* recommended that LUCs coupled with MNA most appropriately addressed the groundwater contamination at the Site. ADEM concurred with the recommendations of the *FFS* to implement LUCs and MNA to address groundwater contamination at the Site (ADEM, 2003a). ADEM also requested that one round of groundwater samples be collected and analyzed for MNA parameters before implementation of LUCs and MNA (ADEM, 2003b). Although it was not identified as a COC in the *RI*, chlorobenzene was included as a COC in the *FFS* because its maximum detected concentration in groundwater exceeded the MCL.

2.4 Corrective Measures

This section includes a brief description of MNA, the selected correctives measures for contaminated groundwater at the Site, and summarizes the previous monitoring events conducted to monitor the effectiveness of MNA at the Site.

2.4.1 Monitored Natural Attenuation

Natural attenuation refers to naturally occurring processes in groundwater that act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contaminants in media. These processes include advection, dispersion, diffusion, sorption and degradation. In-situ biodegradation of organic compounds involve the microbial transfer of electrons from electron donors (e.g., natural organic material, fuel hydrocarbons, and the less oxidized chlorinated solvents) to electron acceptors (e.g., oxygen, nitrate, iron, manganese, sulfate, carbon dioxide, and the more oxidized chlorinated solvents) and can occur under aerobic or anaerobic conditions. Under natural conditions native organic carbon is used as an electron donor and dissolved oxygen (DO) is used first as the prime electron acceptor during aerobic respiration. After the DO is consumed, anaerobic microorganisms typically use additional electron acceptors (as available) in the following order of preference: nitrate, iron, sulfate, and carbon dioxide. Chlorinated solvent degradation largely occurs by reductive dechlorination. In general, reductive dechlorination of chlorinated ethenes occurs by sequential dechlorination as follows:



Intrinsic biodegradation results in changes in the concentrations of microbial respiratory substrates and products. The conditions existing at the site can be determined by examining changes in contaminant concentrations, changes in the concentrations of electron acceptors and products, and changes in groundwater chemistry parameters. Further details concerning the MNA process used at the Site are provided in the *CMIP* (MES, 2006 [Revised 2015]) and the *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (United States Environmental Protection Agency [EPA], 1998).

2.4.2 March/April 2004 Baseline Sampling Event and CMIP

One round of groundwater samples was collected during March/April 2004 to obtain additional data to support implementation of MNA as the selected remedy for contaminated groundwater at the Site. The groundwater samples collected during the March/April 2004 sampling event were analyzed for VOCs and MNA parameters including ethane, ethene, methane, iron, manganese, nitrate, nitrite, and sulfate. The results of the groundwater samples collected in March/April 2004 are presented in *Table 2-4* of the *CMIP* (MES, 2006 [Revised 2015]). The highest concentrations of VOCs were in the groundwater sample collected from residuum monitoring well FTA-94-MW01 and bedrock monitoring well FTA-94-MW11.

The concentrations of the MNA parameters were used to aid in identifying if conditions were favorable to successfully implement MNA. The presence of methane in the bedrock wells and low or nondetect concentrations of nitrate, nitrite, and sulfate indicated that reducing conditions were present and appropriate for biologically mediated reductive dehalogenation of chlorinated solvents. Methane was detected at a higher concentration in bedrock monitoring well FTA-94-MW14 (1,600 micrograms per liter [µg/L]), however, because this well is located upgradient of the contaminated groundwater and groundwater at this location contained detectable concentrations of organic carbon, the higher concentration of methane was believed to be a product of fermentation of organic material.

The *CMIP* incorporated the findings of the previous investigations and the March/April 2004 groundwater sampling. MNA was implemented at the Site as outlined in the *CMIP*.

2.4.3 Summary of Previous Monitoring Events

To monitor the effectiveness of MNA at the Site, groundwater samples were collected during previous monitoring events from February 2005 to January 2019 and analyzed for VOCs and MNA parameters. The results of these monitoring events were submitted to ADEM in the following *CMERs*.

- *Final (Revised) CMER, February 2005 Sampling Event* (MES, 2007a)
- *Final CMER, December 2005 Sampling Event* (MES, 2007b)
- *Final CMER, June 2006 Sampling Event* (MES, 2007c)
- *Final CMER, December 2006 Sampling Event* (MES, 2008)
- *Final CMER, June 2007 Sampling Event* (MES, 2010)
- *Final CMER, December 2007, June 2008, December 2008, December 2009, and December 2010 Monitoring Events* (*December 2007 to December 2010 CMER*) (MES, 2012)
- *CMER, January 2013 Monitoring Event* (MES, 2013a)
- *CMER, January 2014 Monitoring Event* (MES, 2014)
- *CMER, January 2015 Monitoring Event* (*January 2015 CMER*) (MES, 2015a)
- *CMER, January 2016 Monitoring Event (MES, 2016)*
- *CMER, January 2017 Monitoring Event (MES, 2017)*
- *CMER, January 2018 Monitoring Event (MES, 2018)*
- *CMER, January 2019 Monitoring Event (MES, 2019)*
- *CMER, January 2020 Monitoring Event (MES, 2020)*
- *CMER, January 2021 Monitoring Event (MES, 2021)*

VOC concentrations have decreased over time in the residuum and bedrock groundwater, with the exception of bedrock monitoring well FTA-94-MW11. The concentrations for TCE and vinyl chloride in bedrock monitoring well FTA-94-MW11, which is located at the source of the contaminated groundwater, have fluctuated over time around the respective MCLs. The low concentrations of electron acceptor sulfate in groundwater at well FTA-94-MW11 indicated that reducing conditions were present for biologically mediated reductive dehalogenation of chlorinated solvents. Previous groundwater monitoring sample events have shown there is no significant migration of the groundwater contaminant plume from the source area at the Site.

Based on the results of previous groundwater monitoring events, the *December 2007 to December 2010 CMER* (MES, 2012) recommended a reduction in the number of groundwater wells and analytical parameters for future sampling rounds, as described below.

- Collect groundwater samples from residuum monitoring well FTA-94-MW03, and bedrock monitoring wells FTA-94-MW11, FTA-94-MW12, FTA-94-MW13, FTA-94-MW15, and FTA-94-MW16 annually and analyze for VOCs to continue monitoring the effectiveness of MNA and to ensure contaminant migration is not occurring at the Site.
- Analyze the groundwater sample from well FTA-94-MW11 for MNA parameters dissolved oxygen, nitrates, manganese, ferrous iron, sulfate, dissolved gases (methane, ethane, and ethane), and oxidation-reduction potential annually, to ensure conditions remain suitable for MNA.

- Collect water levels from the bedrock wells at the Site to monitor groundwater flow within the bedrock zone.

ADEM concurred with the above recommendations in their letter dated November 7, 2012 (ADEM, 2012).

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3.0 SUMMARY OF JANUARY 2022 MONITORING ACTIVITIES

To meet the recommended actions outlined in the *CMIP* (MES, 2006 [Revised 2017]) and the *December 2007 to December 2010 CMER* (MES, 2012), the following activities were performed during the January 2022 monitoring event:

- Collected groundwater samples from one residuum well (FTA-94-MW03) and five bedrock wells (FTA-94-MW11 to FTA-94-MW13, FTA-94-MW15, and FTA-94-MW16) and analyzed for VOCs by Method SW8260D.
- Collected groundwater levels from the monitoring wells that were sampled (i.e., FTA-94-MW03, FTA-94-MW11 to FTA-94-MW13, FTA-94-MW15, and FTA-94-MW16), plus bedrock wells FTA-94-MW06 and FTA-94-MW14 to monitor groundwater flow in the bedrock zone.
- Collected and analyzed groundwater from bedrock well FTA-94-MW11 for MNA parameters light hydrocarbons by Method RSK-175, total and dissolved iron and manganese by Method SW6010B, ammonia by Method E350.1, total Kjeldahl nitrogen (TKN) by Method E351.2, and anions (nitrate, nitrite, and sulfate) by Method SW9060.

3.1 Groundwater Sampling

Groundwater samples were collected from one residuum and five bedrock wells. Figure 3-1 shows the locations of the groundwater wells. Table 3-1 presents a summary of the groundwater sample station names, field quality control (QC) samples, and analytical parameters.

The groundwater samples were collected in accordance with methodology presented in the *Final Installation Wide Sampling and Analysis Plan* (*SAP*) (MES, 2013b). Before groundwater samples were collected, groundwater 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 procedures, i.e., using an adjustable rate pump to remove water from the screened interval of a monitoring well at a rate that produces minimal drawdown of the groundwater in the well. Polyethylene tubing leading from the discharge side of the submersible pump was connected to a flow-through cell equipped with a YSI Pro Plus Multiprobe Water Quality Meter to measure chemical and physical parameters within the groundwater. Measurements of chemical and physical parameters were used to indicate when groundwater quality stabilized and sampling could begin. Chemical and physical field screening parameters included pH, conductivity, DO, oxidation-reduction potential (ORP), total dissolved solids (TDS), turbidity, and temperature. Groundwater levels, pumping rate, and volume of groundwater removed were also recorded. Ferrous iron was also measured in the field for bedrock well FTA-94-MW11 using a Hach Model IR-18C color disc field test kit and recorded on the sample collection logs along with the chemical and physical field screening parameters. The monitoring well sample collection logs are provided in Appendix A.

Groundwater samples were collected from the polyethylene tubing after it was identified that the field screening data had stabilized. Laboratory-supplied sample bottles were filled, labeled, placed in a chilled cooler, and shipped under chain-of-custody procedures to Eurofins TestAmerica, Savannah, Georgia. The chain-of-custody forms for the groundwater samples collected during the January 2022 sampling event are provided in Appendix B.

3.2 Data Quality Review

MES reviewed the analytical data for the groundwater samples collected during the January 2022 monitoring event. The data quality review was performed in accordance with the *Quality Assurance Plan (QAP) (Appendix A of the SAP)* (MES, 2013b) to assess compliance with the Quality Assurance (QA) objectives, and to assess hard copy and electronic deliverable consistency and integrity. The analytical data for the groundwater samples collected during the January 2022 monitoring event is provided in Tables 4-5 and 4-6. The Data Quality Summary (DQS) for the January 2022 groundwater samples is included in Appendix C.

4.0 RESULTS OF JANUARY 2022 MONITORING EVENT

This section discusses the results of the January 2022 monitoring event conducted at the Site.

4.1 Groundwater Levels

Groundwater elevations measured during the January 2022 groundwater sampling event are presented in Table 4-1. Figure 4-1 shows groundwater elevations and estimated potentiometric contour lines for the bedrock monitoring wells.

As indicated in Figure 4-1, groundwater in the bedrock flows in a northerly direction.

To further aid in assessing groundwater flow at the Site, horizontal hydraulic gradients were calculated using the groundwater data collected in January 2022, presented in Table 4-2. The horizontal hydraulic gradients in the bedrock zone were low ranging from -0.0001 feet per foot (ft/ft) to 0.0363 ft/ft. Site-wide horizontal hydraulic gradients averaged 0.0096 ft/ft for the bedrock.

4.2 Groundwater Field Parameter Results

Measurements of field screening parameters, including pH, conductivity, DO, ORP, TDS, turbidity, and temperature, were used to indicate when groundwater quality had stabilized and sampling could begin. Ferrous iron was also measured and recorded in the field for bedrock well FTA-94-MW11. The field parameters for the groundwater samples are presented in the groundwater sampling logs in Appendix A, and summarized in Table 4-3.

4.3 Analytical Data and Data Quality Review

The analytical data for the January 2022 monitoring event is included in Tables 4-5 and 4-6. MES reviewed the analytical data in accordance with the *QAP* (MES, 2013b). The results of the data quality review for the groundwater samples collected during the January 2022 monitoring event are presented in the DQS in Appendix C. Based on the data quality review, the analytical data generated for these monitoring events are adequate to fulfill program objectives and are suitable for preparation of this report. A more detailed discussion of the analytical results can be found in the DQS (Appendix C).

4.4 Summary of Groundwater Analytical Results

During the January 2022 monitoring event, groundwater samples were collected and analyzed for VOCs and TOC. This section summarizes the analytical results for the groundwater samples.

4.4.1 Volatile Organic Compounds

The analytical results for VOCs detected in the groundwater samples during the January 2022 monitoring event are presented in Table 4-4 and summarized below.

- Chlorobenzene was detected in bedrock well FTA-94-MW11 (69 µg/L).

- Cis-1,2-DCE was detected in bedrock well FTA-94-MW11 (4.5 µg/L).
- Trans-1,2-DCE was detected at an estimated concentration in bedrock well FTA-94-MW11 (2.0 µg/L).
- TCE was detected in residuum well FTA-94-MW03 (0.79 J µg/L), and, bedrock well FTA-94-MW11 (40 µg/L).
- Vinyl chloride was detected in bedrock well FTA-94-MW11 (13 µg/L).

4.4.2 MNA Parameters

Groundwater samples collected from bedrock well FTA-94-MW11 during the January 2022 monitoring event were analyzed for the MNA parameters listed in Table 3-1. The concentrations of these constituents help to assess conditions for attenuation via biodegradation. The analytical results for the MNA parameters for bedrock well FTA-94-MW11 are presented in Table 4-4. Sulfate (3.1 µg/L) and methane (210 µg/L) were detected in well FTA-94-MW11. Ethane, ethene, nitrate and nitrite were either not detected or present at low concentrations. Table 4-6 presents the results for the MNA parameters in bedrock well FTA-94-MW11 from the baseline groundwater sampling event conducted in March 2004 and subsequent groundwater sampling events.

4.5 Evaluation of Remedy Effectiveness

Groundwater samples were collected at the Site to evaluate the MNA at the Site via contaminant concentration changes over time. The analytical results for the Site-specific COCs (chlorobenzene, TCE, and vinyl chloride) and for degradation products cis-1,2-DCE and trans-1,2-DCE for the groundwater samples collected in January 2022 were compared to the analytical results from the previous monitoring events and to MCLs in Table 4-5.

4.5.1 Maximum Contaminant Levels

Analytical results for Site-specific COCs chlorobenzene, TCE, and vinyl chloride and degradation products cis-1,2-DCE and trans-1,2-DCE are compared to the MCLs in Table 4-5. TCE and vinyl chloride concentrations in the bedrock monitoring well FTA-94-MW11 exceeded the MCLs during the January 2022 sampling event.

A table showing the historical detected VOCs concentrations compared to MCLs for the previous sampling rounds conducted through December 2010 is included in Appendix D. Only chlorobenzene, TCE, and vinyl chloride have historically been detected at concentrations greater than the MCLs.

4.5.2 Concentration Trends Over Time

Figure 4-2a and 4-2b show the trends in VOC concentrations and groundwater elevations over time for the Site-specific COCs and degradation products in bedrock well FTA-94-MW11. TCE slightly increased in concentration from 2018 to 2019 while the other COCs exhibited very minor fluctuations or remained the same.

4.5.3 Evidence for Natural Attenuation

The decrease in concentrations of VOCs in well FTA-94-MW11 since the March/April 2004 baseline sampling event provides evidence that MNA is occurring at the Site. The presence of methane, low concentrations of electron acceptor sulfate and dissolved oxygen, in addition to negative ORP indicate that reducing conditions are present for biologically mediated reductive dehalogenation of chlorinated solvents.

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5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This section summarizes the activities and groundwater results for the January 2022 groundwater monitoring event and presents conclusions and recommendations.

5.1 Summary of Activities

Activities conducted at the Site included:

- Collected groundwater levels from one residuum well and seven bedrock wells.
- Collected groundwater samples from one residuum well and five bedrock wells and analyzed for VOCs.
- Collected and analyzed groundwater from bedrock well FTA-94-MW11 for MNA parameters light hydrocarbons, total and dissolved iron and manganese, ammonia, nitrate, nitrite, sulfate, and TKN.
- Compared analytical results to MCLs to assess the ongoing monitored natural attenuation at the Site.

5.2 Summary of Results

The following summarizes the results of the January 2022 monitoring event:

- Groundwater in the bedrock flows in a northerly direction (Figure 4-1).
- The horizontal hydraulic gradients in the bedrock zone were low, ranging from -0.0001 ft/ft to 0.0363 ft/ft and averaging 0.0096 ft/ft Site-wide for the bedrock (Table 4-2).
- Five VOCs (chlorobenzene, cis-1,2-DCE, trans-1,2-DCE, TCE, and vinyl chloride) were detected in one or more of the January 2022 groundwater samples (Table 4-4).
- All COCs exhibited minor fluctuations (Figure 4-2).
- TCE and vinyl chloride in well FTA-94-MW11 exceeded MCLs during the January 2022 sampling event (Table 4-5).
- The presence of methane and low concentrations of electron acceptor sulfate indicate that reducing conditions are present for biologically mediated reductive dehalogenation of chlorinated solvents.

5.3 Conclusions and Recommendations

The presence of methane, low concentrations of electron acceptor sulfate and dissolved oxygen, as well as negative ORP in groundwater at the Site indicate that conditions are still favorable for biologically-mediated MNA at the Site. The low magnitudes of the horizontal hydraulics gradients indicate limited groundwater movement at the Site. Past and present groundwater monitoring sample events have shown there is no significant migration of the groundwater contaminant plume from the source area at the Site, i.e., bedrock monitoring well FTA-94-MW11. The concentrations for COCs in bedrock monitoring well FTA-94-MW11 continue to fluctuate over time, with TCE and vinyl chloride levels greater than the MCLs in January 2022. The process to restore groundwater concentrations of COCs and degradation products to below MCLs may take several decades. Based on the results of the January 2022 monitoring event, the MDA recommends continued groundwater monitoring at the Site.

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Tables

Table 3-1: Groundwater Samples and Parameters, January 2022 Monitoring Event
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Station Name	Sample Date	Matrix	QC Code	WLs[1]	E650.1	E351.2	RSK-175	SW6010B	SW8260D	SW9056
FTA-94-MW01	*	WG	NS	X						
FTA-94-MW02	*	WG	NS	X						
FTA-94-MW03	1/25/22	WG	NS	X					X	
FTA-94-MW04	*	WG	NS	X						
FTA-94-MW05	*	WG	NS	X						
FTA-94-MW06	*	WG	NS	X						
FTA-94-MW07	*	WG	NS	X						
FTA-94-MW08	*	WG	NS	X						
FTA-94-MW09	*	WG	NS	X						
FTA-94-MW10	*	WG	NS	X						
FTA-94-MW11	1/25/22	WG	NS	X	X	X	X	X	X	X
FTA-94-MW11	1/25/22	WG	FD		X	X	X	X	X	X
FTA-94-MW12	1/25/22	WG	NS	X					X	
FTA-94-MW13	1/25/22	WG	NS	X					X	
FTA-94-MW14	*	WG	NS	X						
FTA-94-MW15	1/25/22	WG	NS	X					X	
FTA-94-MW16	1/25/22	WG	NS	X					X	
TB592	1/25/22	W	TB						X	

Notes:

EB = Equipment blank
FD = Field duplicate
LD = Laboratory duplicate
MS = Matrix Spike
MSD = Matrix Spike Duplicate
NS = Normal Sample
QC = Quality control
TB = Trip blank
W = Water
WG = Groundwater
WS = Source water

Method SW8260D = Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)
Monitored Natural Attenuation Parameters:
Method SE350.1 = Ammonia by spectrophotometry
Method E351.2 = Total Kjeldahl Nitrogen (TKN) by spectrophotometry
Method RSK-175 = Methane, Ethane, and Ethene by gas chromatography (GC)
Method SW6010B = Total and Dissolved Iron and Manganese by Inductively Coupled Plasma-Atomic Emission Spectrometry
Method SW9056 = Anions (Sulfate, Nitrate, Nitrite) by Ion Chromatography

[1] Water Levels (WLs) were collected on 1/24/22.
* No groundwater sample was collected, only WLs were collected on 1/24/22.

Table 4-1: Groundwater Elevations, January 2022 Monitoring Event
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Measurement Date	Depth to Water (ft BTOC)	Ground Elevation (ft msl)	Top of Casing Elevation (ft msl)	Screen Interval (ft bgs)	Well Depth (ft BTOC)	Groundwater Elevation (ft msl)
FTA-94-MW03	residuum	1/24/2022	4.90	784.57	786.49	6 - 21	22.60	781.59
FTA-94-MW06	bedrock	1/24/2022	5.03	787.84	789.78	5.5 - 20.5	27.69	784.75
FTA-94-MW11	bedrock	1/24/2022	22.42	804.82	806.79	57.2 - 67.2	70.81	784.37
FTA-94-MW12	deep bedrock	1/24/2022	3.61	785.13	787.16	81.1 - 91.1	93.95	783.55
FTA-94-MW13	deep bedrock	1/24/2022	23.98	805.89	808.06	116 - 126	127.9	784.08
FTA-94-MW14	bedrock	1/24/2022	16.51	807.44	807.2	65 - 75	75.30	790.69
FTA-94-MW15	deep bedrock	1/24/2022	11.65	793.14	795.19	35 - 45	93.32	783.54
FTA-94-MW16	bedrock	1/24/2022	9.78	790.99	793.0	81.4 - 91.4	46.65	783.22

Notes:
bgs = below ground surface
BTOC = Below top of casing
ft = feet
msl = Mean sea level

Table 4-2: Horizontal Hydraulic Gradients, January 2022 Monitoring Event
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Upgradient Well	Well Type	Groundwater Elevation	Downgradient Well	Well Type	Groundwater Elevation	Estimated Groundwater Flow Direction	Horizontal Distance	Groundwater Elevation Difference (feet)	Horizontal Gradient (ft/ft)
FTA-94-MW06	bedrock	784.75	FTA-94-MW12	deep bedrock	783.55	north-northwest	313	1.20	0.0038
FTA-94-MW11	bedrock	784.37	FTA-94-MW12	deep bedrock	783.55	northeast	277	0.82	0.0030
FTA-94-MW11	bedrock	784.37	FTA-94-MW13	deep bedrock	784.08	southwest	47	0.29	0.0061
FTA-94-MW11	bedrock	784.37	FTA-94-MW16	bedrock	782.03	north	281	2.34	0.0083
FTA-94-MW14	bedrock	790.69	FTA-94-MW13	deep bedrock	783.22	north	206	7.47	0.0363
FTA-94-MW15	deep bedrock	783.54	FTA-94-MW12	deep bedrock	783.55	east	155	-0.01	-0.0001
							Average Horizontal Gradient:		**0.0096**

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

Table 4-3: Groundwater Field Parameters, January 2022 Monitoring Event
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Sample Location	Well Type	Sample Date	Temperature (°C)	Conductivity (µs/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	TDS (g/L)	Turbidity (NTU)	pH	Fe (II) (mg/L)
FTA-94-MW03	residuum	1/25/22	14.0	432	1.3	2	431.6	70	7.6	NM
FTA-94-MW11	bedrock	1/25/22	16.2	413	0.8	-22	0.27	4	7.2	0
FTA-94-MW12	deep bedrock	1/25/22	14.9	443	3.0	-148	0.29	3	7.9	NM
FTA-94-MW13	deep bedrock	1/25/22	14.4	429	1.0	-181	0.28	3	8.7	NM
FTA-94-MW15	deep bedrock	1/25/22	15.3	530	0.5	17	0.36	8	8.0	NM
FTA-94-MW16	bedrock	1/25/22	15.9	225	4.1	-10	0.15	3	10.5	NM

Notes:

°C = Degrees Celsius

Fe (II) = Ferrous Iron

g/L = Grams per liter

mg/L = Milligrams per liter

µs/cm = Microsiemens per centimeter

mV = Millivolts

NM = Not measured

NTU = Nephelometric turbidity units

ORP = Oxidation-reduction potential

TDS = Total Dissolved Solids

Table 4-4: Groundwater Results for Detected VOCs and MNA Parameters, January 2022 Monitoring Event
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston Alabama

Method	Parameters	Units	FTA-94-MW03 1/25/22	FTA-94-MW11 1/25/22	FTA-94-MW12 1/25/22	FTA-94-MW13 1/25/22	FTA-94-MW15 1/25/22	FTA-94-MW16 1/25/22
VOCs								
SW8260B	Chlorobenzene	µg/L	< 1	69	< 1	< 1	< 1	< 1
SW8260B	Cis-1,2-Dichloroethene	µg/L	< 1	4.5	< 1	< 1	< 1	< 1
SW8260B	Trans-1,2-Dichloroethene	µg/L	< 1	2	< 1	< 1	< 1	< 1
SW8260B	Trichloroethene	µg/L	0.79 J	40	< 1	< 1	< 1	< 1
SW8260B	Vinyl Chloride	µg/L	< 1	13	< 1	< 1	< 1	< 1
MNA Parameters								
RSK-175	Ethene	µg/L	--	2.7	--	--	--	--
RSK-175	Methane	µg/L	--	210	--	--	--	--
SW6010C	Iron	µg/L	--	220	--	--	--	--
SW6010C	Iron, dissolved	µg/L	--	67 J	--	--	--	--
SW6010C	Manganese	µg/L	--	33	--	--	--	--
SW6010C	Manganese, dissolved	µg/L	--	30	--	--	--	--
SW9056A	Nitrate	mg/L	--	0.042 J	--	--	--	--
SW9056A	Sulfate	mg/L	--	3.1	--	--	--	--

Notes:
-- = not analyzed/sampled
< = Indicates the analyte was not detected at the reported quantitation limit shown.
µg/L = micrograms per liter
mg/L = milligrams per liter
MNA = Monitored Natural Attenuation
VOCs = Volatile Organic Compounds

Lab Flag:
J = Estimated detection. Concentration is between the method detection limit and the reporting limit.

Table 4-5: VOC COCs and Degradation Products in Groundwater Compared to MCLs
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston Alabama

		FTA-94-MW03 (Residuum)																	
VOCs (µg/L)	**MCL**	**11/29/00**	**4/2/02**	**3/24/04**	**2/11/05**	**12/13/05**	**6/20/06**	**12/11/06**	**6/18/07**	**12/10/07**	**6/25/08**	**12/9/08**	**12/22/09**	**12/15/10**	**1/22/13**	**1/14/14**	**1/13/15**	**1/12/16**	**1/17/17**
Chlorobenzene (COC)	100	< 5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene (DP)	70	< 5	0.22 J	< 1	< 1	< 1	< 1	< 1	0.22 J	< 1	0.28 J	< 1	0.31 J	0.26 J	0.3 J	0.28 J	0.24 J	< 1.0	< 1.0
trans-1,2-Dichloroethene (DP)	100	< 5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene (COC)	5	2.5 J (J)	1.5	1	0.76 J	0.8 J	1.2	0.73 J	1.1	1.3	1.1	0.9 J	1.1	1.1	0.81 J	0.86 J	0.9 J	0.93 J	1.1
Vinyl Chloride (COC)	2	< 5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8

		FTA-94-MW03 (Residuum)				
VOCs (µg/L)	**MCL**	**1/23/18**	**1/9/19**	**1/27/20**	**1/20/21**	**1/25/22**
Chlorobenzene (COC)	100	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene (DP)	70	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1	< 1	< 1
Trichloroethene (COC)	5	0.52 J	0.80 J	0.69 J	0.52 J	0.79 J
Vinyl Chloride (COC)	2	< 0.8	< 1	< 1	< 1	< 1

		FTA-94-MW11 (Bedrock)																	
VOCs (µg/L)	**MCL**	**12/18/00**	**3/23/04**	**2/8/05**	**12/15/05**	**6/19/06**	**12/11/06**	**6/18/07**	**12/13/07**	**6/24/08**	**12/8/08**	**12/22/09**	**12/14/10**	**1/22/13**	**1/15/14**	**1/14/15**	**1/12/16**	**1/17/17**	**1/23/18**
Chlorobenzene (COC)	100	300	10	4.1	25	31	11	< 1	16	< 1	2.4	< 1	12	< 1	18	< 1.0	4.3 (JM)	17	28
cis-1,2-Dichloroethene (DP)	70	37	13	6.2	12	19	9	< 1	5.4	< 1	6.9	< 1	4.4	< 1	3.6	< 1.0	1.8	3.8	6.9
trans-1,2-Dichloroethene (DP)	100	8.3	2	0.76 J	1	1.6	1.1	< 1	1.2	< 1	0.61 J	< 1	0.62 J	< 1	0.84 J	< 1.0	0.50 J	0.83 J	1.2
Trichloroethene (COC)	5	75	34	16	18	41	16	1.1	6	1.2	5.2	0.98 J	3.4	< 1	25	0.49 J	10 (JM)	5.3	17
Vinyl Chloride (COC)	2	25	1.4	0.52 J	2.4	8.3	9.7	< 1	13	< 0.8	2	< 0.8	16	< 0.8	8.9	< 0.8	9.3	20	20

		FTA-94-MW11 (Bedrock)			
VOCs (µg/L)	**MCL**	**1/9/19**	**1/28/20**	**1/20/21**	**1/25/22**
Chlorobenzene (COC)	100	39	41	53	69
cis-1,2-Dichloroethene (DP)	70	3.8	4.4	5.2	4.5
trans-1,2-Dichloroethene (DP)	100	1.7	1.7	1.5	2
Trichloroethene (COC)	5	39	54	34	40
Vinyl Chloride (COC)	2	6.6	4.7	14	13

Table 4-5: VOC COCs and Degradation Products in Groundwater Compared to MCLs
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston Alabama

		FTA-94-MW12 (Deep Bedrock)																	
VOCs (µg/L)	**MCL**	**5/24/01**	**3/25/04**	**2/14/05**	**12/13/05**	**6/20/06**	**12/11/06**	**6/18/07**	**12/12/07**	**6/25/08**	**12/9/08**	**12/22/09**	**12/15/10**	**1/22/13**	**1/14/14**	**1/13/15**	**1/12/16**	**1/18/17**	**1/23/18**
Chlorobenzene (COC)	100	< 5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1
cis-1,2-Dichloroethene (DP)	70	< 5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.32 J	< 1.0	< 1.0	< 1.0	< 1
trans-1,2-Dichloroethene (DP)	100	< 5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Trichloroethene (COC)	5	< 5	< 1	< 1	0.74 J	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1
Vinyl Chloride (COC)	2	< 5	< 1	< 1	< 1	< 1	0.28 J	< 1	< 1	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8

		FTA-94-MW12 (Deep Bedrock)			
VOCs (µg/L)	**MCL**	**1/9/19**	**1/27/20**	**1/20/21**	**1/25/22**
Chlorobenzene (COC)	100	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene (DP)	70	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1	< 1
Trichloroethene (COC)	5	< 1	< 1	< 1	< 1
Vinyl Chloride (COC)	2	< 1	< 1	< 1	< 1

		FTA-94-MW13 (Deep Bedrock)																	
VOCs (µg/L)	**MCL**	**7/18/01**	**10/15/01**	**4/3/02**	**3/23/04**	**2/8/05**	**6/19/06**	**12/13/06**	**6/18/07**	**12/12/07**	**6/24/08**	**12/8/08**	**12/15/09**	**12/14/10**	**1/22/13**	**1/15/14**	**1/14/15**	**1/12/16**	**1/17/17**
Chlorobenzene (COC)	100	< 1	< 1 (nv)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene (DP)	70	0.6 J (J)	0.46 J (nv)	0.62 J	0.72 J	0.22 J	0.83 J	< 1	< 1	1.3	1	0.93 J	0.88 J	0.53 J	0.48 J	< 1.0	0.37 J	0.27 J	0.27 J
trans-1,2-Dichloroethene (DP)	100	< 1	< 1 (nv)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene (COC)	5	7	4.8 (nv)	5.5	10	2	1 J	0.34 J	0.26 J	< 1	0.28 J	0.29 J	0.35 J	0.24 J	0.2 J	< 1.0	< 1.0	< 1.0	0.24 J
Vinyl Chloride (COC)	2	< 1	< 2 (nv)	< 1	< 1	< 1	< 1	< 1	< 1	0.37 J	< 0.8	< 0.8	0.25 J	< 0.8	0.27 J	< 0.8	< 0.8	< 0.8	< 0.8

		FTA-94-MW13 (Deep Bedrock)				
VOCs (µg/L)	**MCL**	**1/23/18**	**1/9/19**	**1/27/20**	**1/20/21**	**1/25/22**
Chlorobenzene (COC)	100	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene (DP)	70	0.22 J	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1	< 1	< 1
Trichloroethene (COC)	5	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride (COC)	2	< 0.8	< 1	< 1	< 1	< 1

Table 4-5: VOC COCs and Degradation Products in Groundwater Compared to MCLs
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston Alabama

		FTA-94-MW15 (Deep Bedrock)																	
VOCs (µg/L)	**MCL**	**7/20/01**	**4/2/02**	**3/23/04**	**2/10/05**	**12/19/05**	**6/21/06**	**12/13/06**	**6/20/07**	**12/12/07**	**6/25/08**	**12/9/08**	**12/14/09**	**12/14/10**	**1/21/13**	**1/14/14**	**1/14/15**	**1/11/16**	**1/17/17**
Chlorobenzene (COC)	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene (DP)	70	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene (COC)	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride (COC)	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8

		FTA-94-MW15 (Deep Bedrock)				
VOCs (µg/L)	**MCL**	**1/22/18**	**1/9/19**	**1/27/20**	**1/20/21**	**1/25/22**
Chlorobenzene (COC)	100	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene (DP)	70	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1	< 1	< 1
Trichloroethene (COC)	5	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride (COC)	2	< 0.8	< 1	< 1	< 1	< 1

		FTA-94-MW16 (Bedrock)																	
VOCs (µg/L)	**MCL**	**7/19/01**	**3/25/04**	**2/10/05**	**12/20/05**	**6/21/06**	**12/13/06**	**6/20/07**	**12/12/07**	**6/25/08**	**12/9/08**	**12/14/09**	**12/14/10**	**1/21/13**	**1/14/14**	**1/13/15**	**1/11/16**	**1/17/17**	**1/22/18**
Chlorobenzene (COC)	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene (DP)	70	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene (COC)	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.27 J	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride (COC)	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8

		FTA-94-MW16 (Bedrock)				
VOCs (µg/L)	**MCL**	**1/9/19**	**1/27/20**	**1/20/21**		**1/25/22**
Chlorobenzene (COC)	100	< 1	< 1	< 1		< 1
cis-1,2-Dichloroethene (DP)	70	< 1	< 1	< 1		< 1
trans-1,2-Dichloroethene (DP)	100	< 1	< 1	< 1		< 1
Trichloroethene (COC)	5	0.67 J	< 1	< 1		< 1
Vinyl Chloride (COC)	2	< 1	< 1	< 1		< 1

Notes:
< = Indicates the analyte was not detected at the reported quantitation limit shown.
COC = Constituent of concern
DP = Degradation product
µg/L = micrograms per liter
MCL = Maximum Contaminant Level
VOCs = Volatile Organic Compounds

Result > MCL

Lab Flag:
J = Estimated detection. Concentration is between the method detection limit and the practical quantitation limit.
Validation Flags:
(nv) = Not validated
(J) = The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample.
(JM) = Estimated detection; matrix spike and matrix spike duplicate were outside laboratory control limits.

Samples collected in 2000 through 2002 by IT Corporation (IT), data from IT's *Remedial Investigation* (IT, 2002).
Samples collected in 2004 to the present by Matrix Environmental Services, LLC (MES).

Table 4-6: Current and Historical Groundwater Results for MNA Parameters for Well FTA-94-MW11
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston Alabama

MNA Parameters	Units	FTA-94-MW11							
		3/23/04 (Baseline)	2/8/05	12/15/05	6/19/06	12/11/06	6/18/07	12/13/07	6/24/08
Ethane	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Ethene	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Methane	µg/L	17	7.7	27	33	11	0.71 J	15	< 1.2
Iron (Total)	mg/L	1.81	0.656 J	0.605 J	--	0.393 J	0.0418 J	0.505 J	0.299 J
Iron (Dissolved)	mg/L	1.32	0.517 J	0.315 J	--	< 1	< 1	0.0563 J	< 1
Manganese (Total)	mg/L	0.146	0.125	0.0858	--	0.0542	0.0113	0.0778	0.0372
Manganese (Dissolved)	mg/L	0.135	0.111	0.0886	--	0.0686	0.0041 J	0.0788	< 0.01
Nitrate-N	mg/L	< 0.1	0.112	(UJC)	--	< 0.1	0.11	< 0.1	0.198
Nitrite-N	mg/L	< 0.1	< 0.1	< 0.1	--	< 0.1	< 0.1	< 0.1	< 0.1
Sulfate	mg/L	7.6	10.8	5.52	--	6.67	7.47	9.76	9.33
Ammonia (NH3-N)	mg/L	< 0.1	0.352	< 0.1	--	< 0.1	0.19	< 0.1	0.304
Total Kjeldahl Nitrogen (TKN)	mg/L	0.306	0.522	0.19 (JC)	--	0.158	0.235	0.167	0.309

MNA Parameters	Units	FTA-94-MW11							
		12/8/08	12/15/09	12/14/10	1/22/13	1/15/14	1/14/15	1/12/16	1/17/17
Ethane	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Ethene	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	1.3 J	< 1.5	< 1.5	0.7 J
Methane	µg/L	8.5	< 1.2	67	0.4 J	30	< 1.2	5.4 (JQ)	13
Iron (Total)	mg/L	0.213 J	0.0547 J	0.391 J	0.135 J	0.184 J	0.0427 J	0.330 J	1.25
Iron (Dissolved)	mg/L	< 1	< 1	< 1	0.0565 J	0.0627 J	< 1.0	0.139 J	0.340 J
Manganese (Total)	mg/L	0.117	0.00503 J	0.065	0.0133	0.0165	< 0.01	(JQ)	0.0513
Manganese (Dissolved)	mg/L	0.119	< 0.010	0.022	0.00605 J	0.00967 J	< 0.01	0.0177	0.0508
Nitrate-N	mg/L	< 0.1	0.0559 J	0.0842 J	0.0822 J	< 0.1	0.179	0.0584 J	0.104
Nitrite-N	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sulfate	mg/L	12.7	5.48	5.39	4.87	4.22	3.68	5.08 (JQ)	4.18
Ammonia (NH3-N)	mg/L	< 0.1	0.121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total Kjeldahl Nitrogen (TKN)	mg/L	0.13	0.397	0.307	0.368	0.701	0.226	0.175	0.168

Table 4-6: Current and Historical Groundwater Results for MNA Parameters for Well FTA-94-MW11
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston Alabama

		FTA-94-MW11				
MNA Parameters	**Units**	**1/23/18**	**1/9/19**	**1/28/20**	**1/20/21**	**1/25/22**
Ethane	µg/L	< 1.5	< 1.1	< 1.1	< 1.1	< 1.1
Ethene	µg/L	1 J	< 1	< 1.0	2.2	2.7
Methane	µg/L	34	< 0.58	58	170	210
Iron (Total)	mg/L	0.881 J	0.11	17 J	400	220
Iron (Dissolved)	mg/L	0.411 J	0.025 J	< 50	210	67 J
Manganese (Total)	mg/L	0.0535	0.015	15	51	33
Manganese (Dissolved)	mg/L	0.0698	0.0093 J	9.8 J	45	30
Nitrate-N	mg/L	< 0.1	< 0.05	< 0.050	0.045 J (J)	0.042 J
Nitrite-N	mg/L	< 0.1	< 0.05	< 0.050	< 0.050 (UJ)	< 0.05
Sulfate	mg/L	4.17	3.8	7.1	2.9	3.1
Ammonia (NH3-N)	mg/L	0.0758 J	< 0.25 (UJ)	< 0.25	< 0.25	< 0.25
Total Kjeldahl Nitrogen (TKN)	mg/L	0.183	0.11 J	< 0.20	< 0.40	< 0.40

Notes:

-- = not analyzed/sampled

< = Indicates the analyte was not detected at the reported quantitation limit shown.

µg/L = micrograms per liter

mg/L = milligrams per liter

MNA = Monitored Natural Attenuation

Lab Flag:

J = Estimated detection. Concentration is between the method detection limit and the reporting limit.

Validation Qualifiers (denoted with parenthesis):

J = Estimated detection. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ = Estimated reporting limit due to low QC recovery(ies).

Validation Sub-qualifiers:

C = Continuing calibration was outside method-specific control limits.

M = Matrix spike/matrix spike duplicate outside project criteria.

Q = Field duplicate was outside project criteria.

Figures

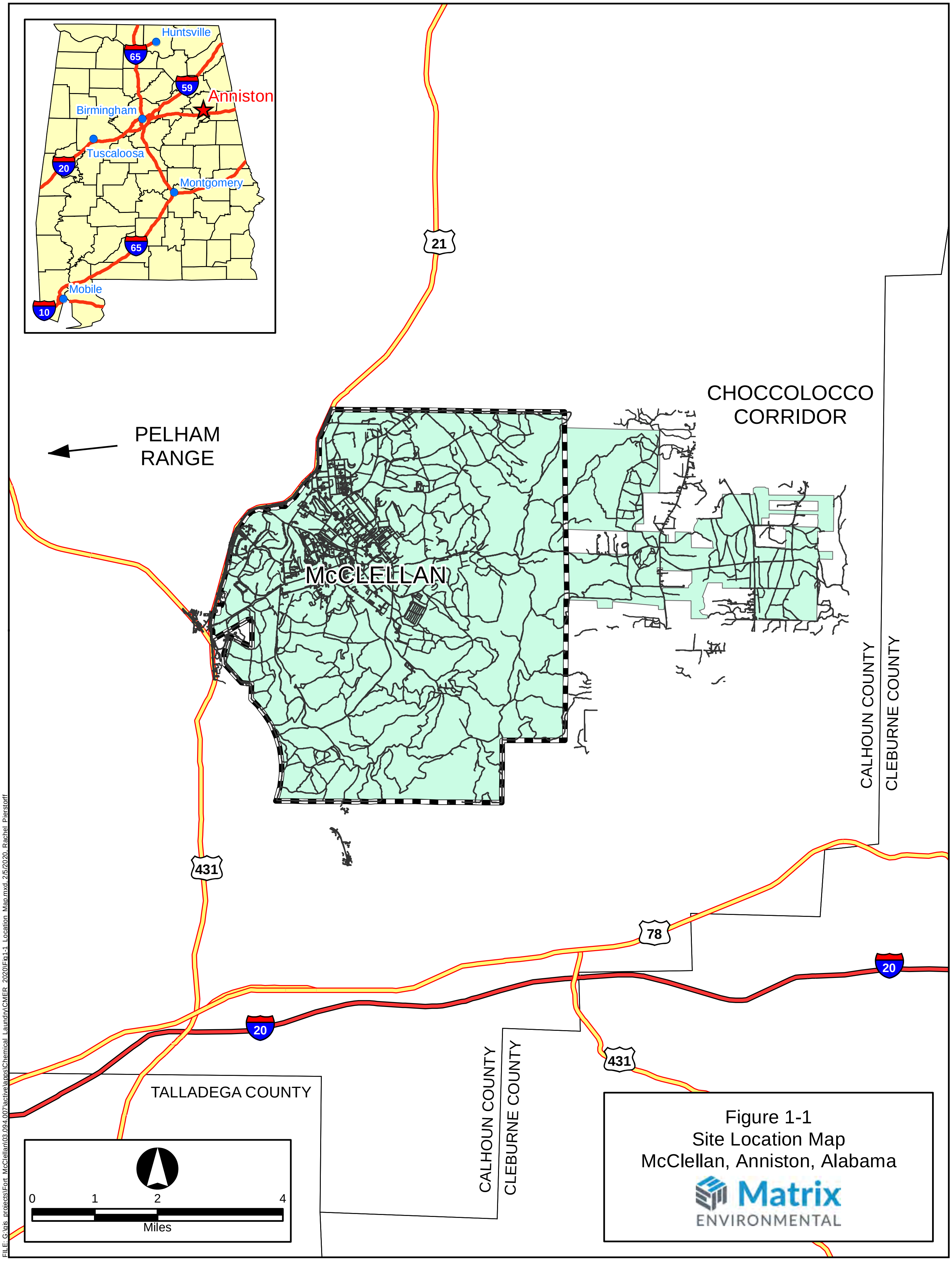

Figure 1-1
Site Location Map
McClellan, Anniston, Alabama

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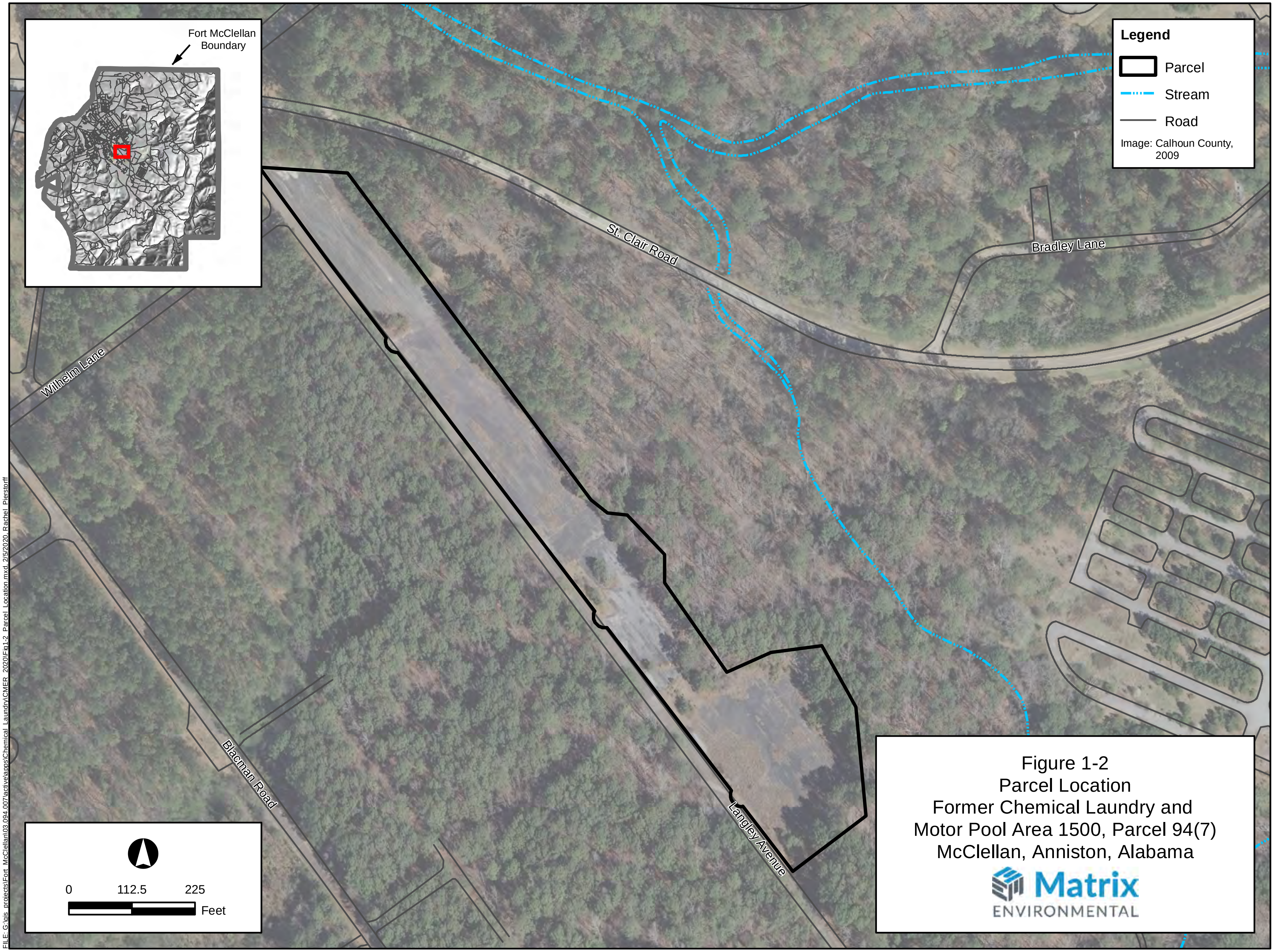

Figure 1-2
Parcel Location
Former Chemical Laundry and
Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Matrix ENVIRONMENTAL

FILE: G:\gis_projects\Fort_McClellan\03.094.007\active\apps\Chemical_Laundry\CMER_2020\Fig1-2_Parcel_Location.mxd, 2/5/2020, Rachel_Pierstorff

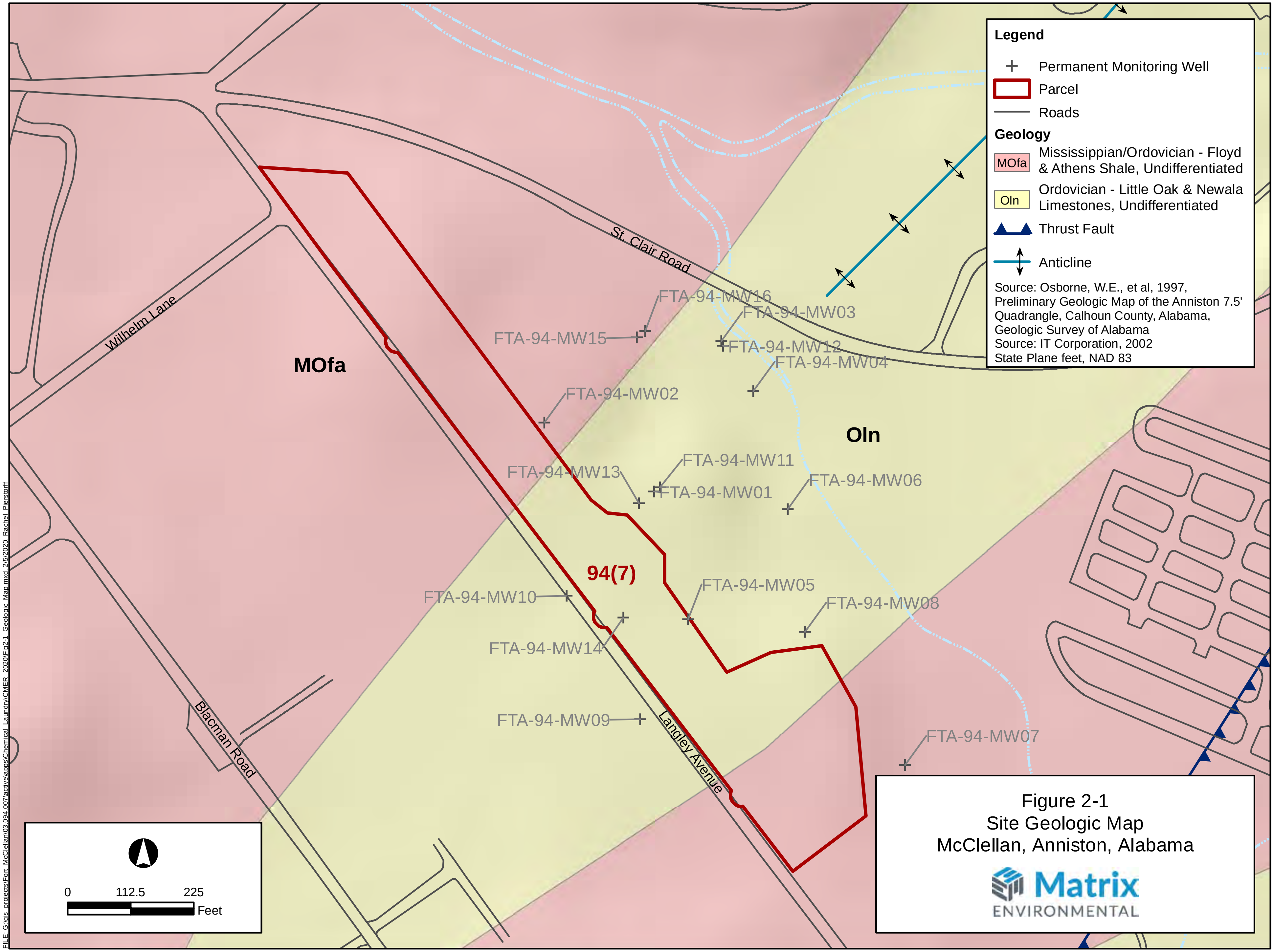

Figure 2-1
Site Geologic Map
McClellan, Anniston, Alabama

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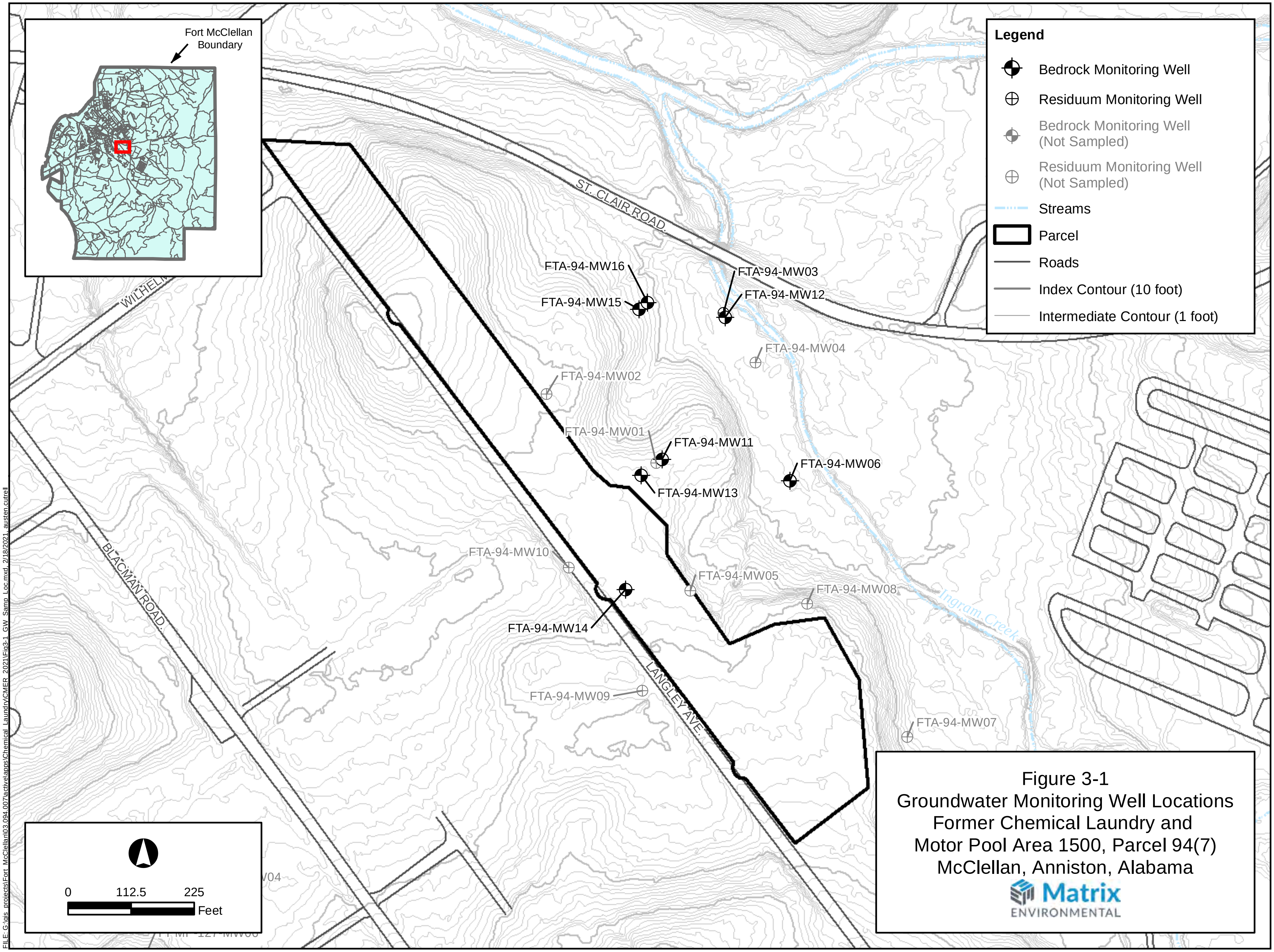

Figure 3-1
Groundwater Monitoring Well Locations
Former Chemical Laundry and
Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Matrix ENVIRONMENTAL

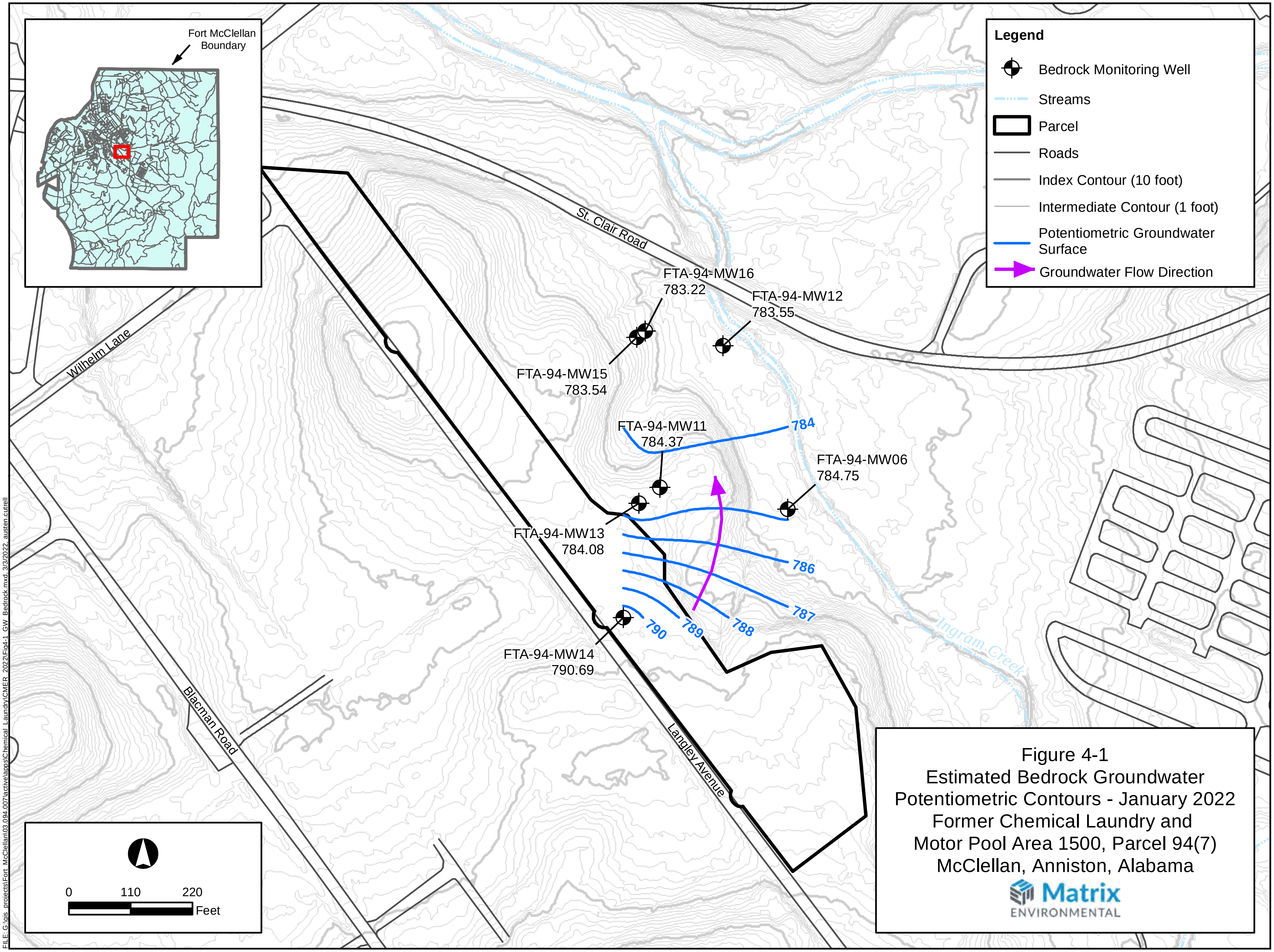

Figure 4-1
Estimated Bedrock Groundwater Potentiometric Contours - January 2022
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama

Matrix ENVIRONMENTAL

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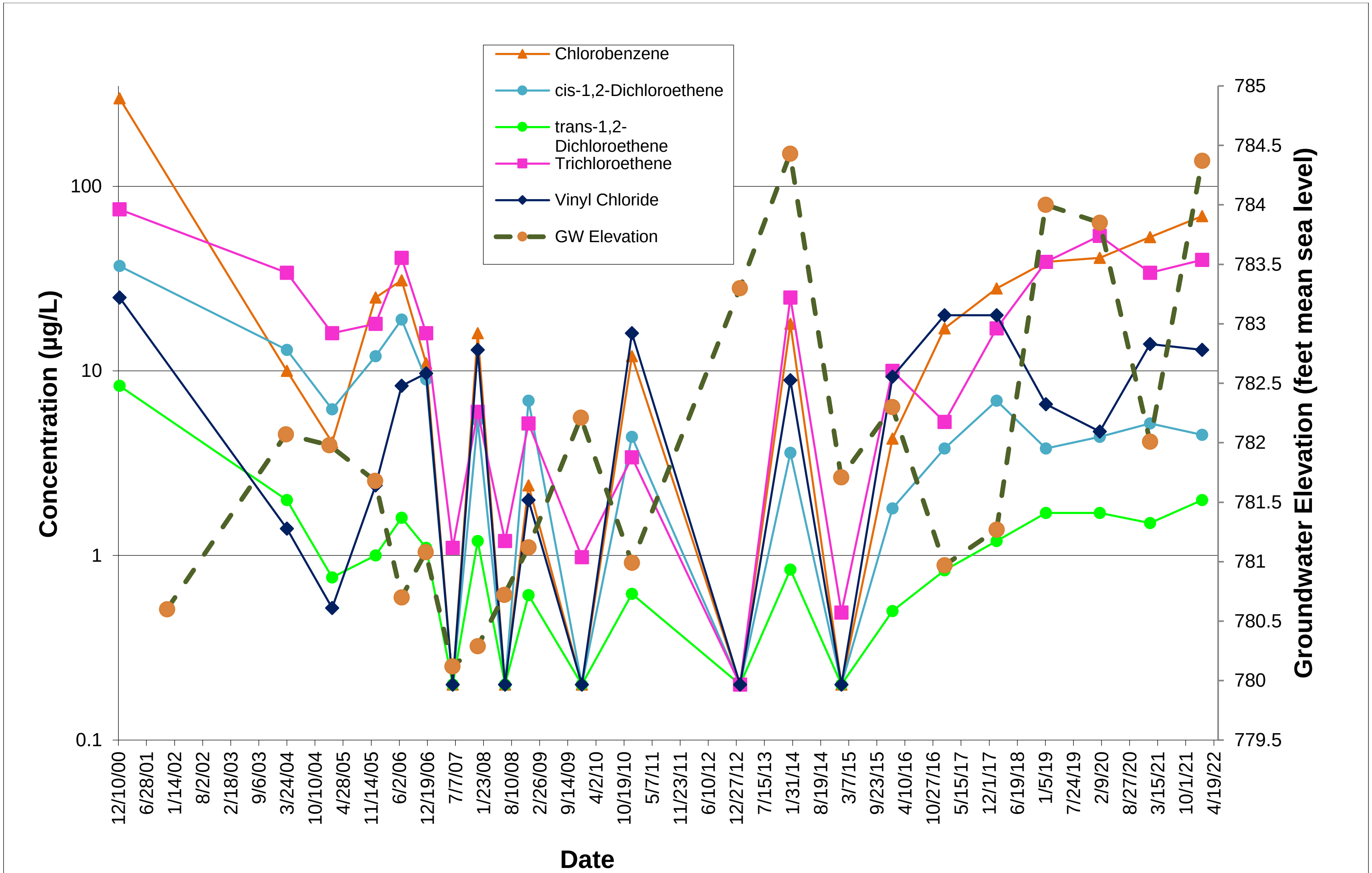
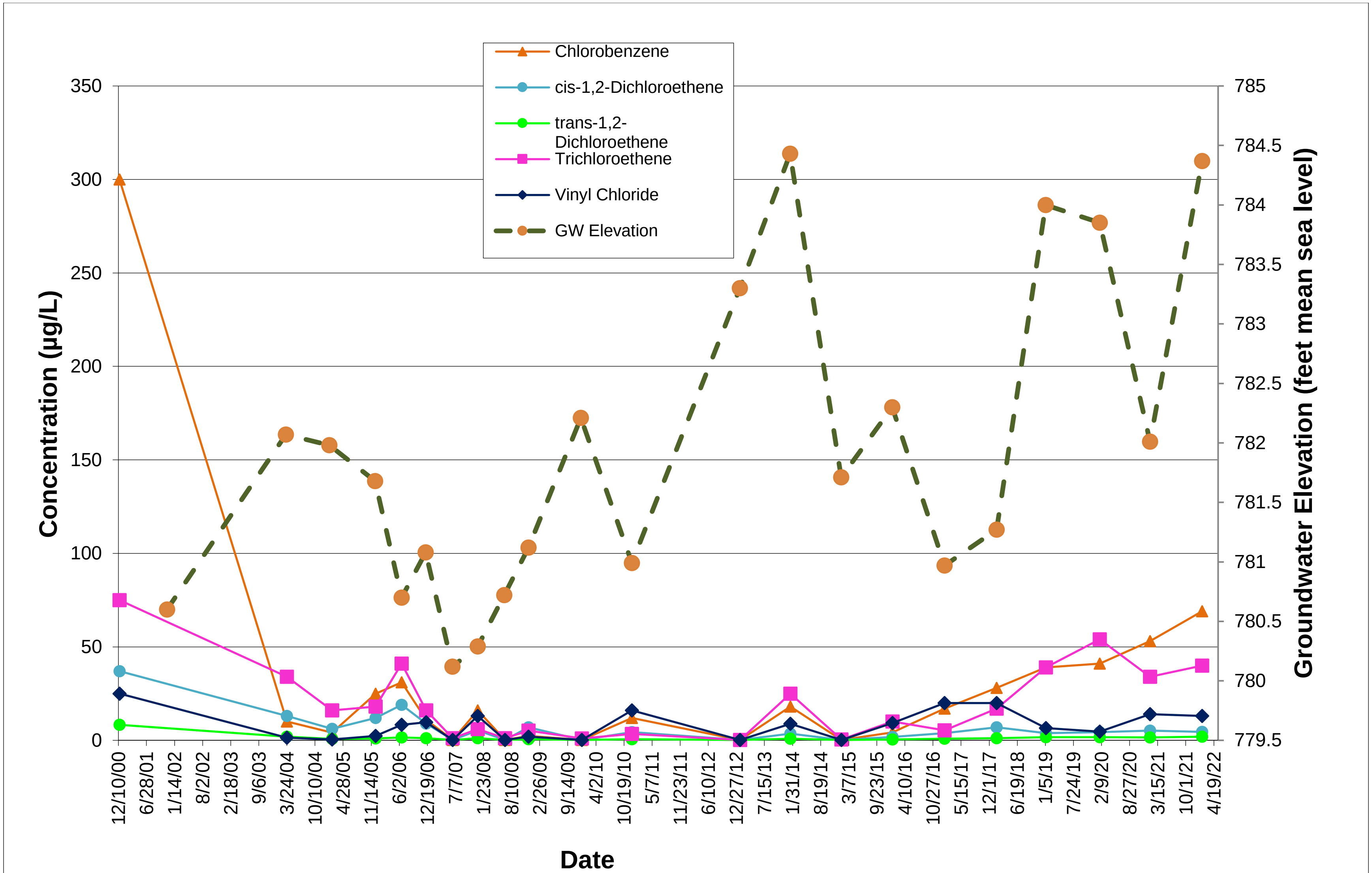


non-detects set equal to the detection limit

Matrix ENVIRONMENTAL

Figure 4-2a: VOC Concentrations and Groundwater Trends Well FTA-94-MW11 (Logarithmic Scale)
Former Chemical Laundry and
Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama



non-detects set equal to the detection limit

Matrix ENVIRONMENTAL

Figure 4-2b: VOC Concentrations and Groundwater Trends Well FTA-94-MW11 (Linear Scale)

Former Chemical Laundry and
Motor Pool Area 1500, Parcel 94(7)
McClellan, Anniston, Alabama