DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

18 December 2020

Colonel David S. Miller, USAF
Commander
377th Air Base Wing
2000 Wyoming Blvd SE
Kirtland AFB NM 87117

Mr. Kevin Pierard
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Mr. Pierard

Please find attached the *Quarterly Monitoring Report for July – September 2020 for the Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, New Mexico,* dated December 2020. This report summarizes groundwater monitoring and interim measure activities associated with the distal plume capture and treatment system at Solid Waste Management Units ST-106/SS-111. In accordance with Discharge Permit 1839, Conditions B19 and B22, the Injection Well KAFB-7 Maintenance Report is included as Appendix 1-7 for submittal to the New Mexico Environment Department Groundwater Quality Bureau.

If you have any questions or concerns, please contact Mr. Sheen Kottkamp at commercial line (505)846-7674 or email sheen.kottkamp.1@us.af.mil.

Sincerely

DAVID S. MILLER, Colonel, USAF
Commander

Attachment:
Quarterly Monitoring Report for July-September 2020, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, New Mexico, dated December 2020; 2 Hard Copies/2 CDs

cc:
NMED Resource Protection Division (Stringer), letter and CD
NMED HWB (Cobrain), letter and CD
NMED GWQB (Hunter), letter and CD
EPA Region 6 (King, Ellinger), letter and CD
COA (Zeigler), letter and CD
ABCWUA (Agnew), letter and CD
SAF-IEE (Lynnes), electronic only

KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

QUARTERLY MONITORING REPORT –
JULY–SEPTEMBER 2020
BULK FUELS FACILITY
SOLID WASTE MANAGEMENT UNITS ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO

DECEMBER 2020

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KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

Quarterly Monitoring Report – July–September 2020
Bulk Fuels Facility
Solid Waste Management Units ST-106/SS-111
Kirtland Air Force Base, New Mexico

December 2020

Prepared for
Kirtland Air Force Base
2050 Wyoming Boulevard SE
Kirtland Air Force Base, New Mexico 87117-5270

Prepared by
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14. ABSTRACT This Quarterly Report describes monitoring activities performed from July 1 through September 30, 2020 and the progress of the Resource Conservation and Recovery Act interim measure for groundwater remediation at Solid Waste Management Units ST-106/SS-111, the Bulk Fuels Facility site, at Kirtland Air Force Base, New Mexico. During the quarter, groundwater, drinking water from supply wells, and the groundwater treatment system (GWTS) samples were collected and analyzed for contaminants of concern (notably ethylene dibromide [EDB]) and other relevant field and laboratory parameters. Areas of high and low contaminant of concern concentrations remained consistent with previous quarters. The GWTS extracted and treated 65,411,600 gallons of groundwater through a granular activated carbon filtration system and discharged the treated effluent to the Tijeras Arroyo Golf Course main pond and injection well KAFB-7 in the third quarter (Q3) 2020. The GWTS was running 96.0 percent of the time and removed approximately 2,870 milligrams of EDB in Q3 2020.						
15. SUBJECT TERMS Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, ethylene dibromide, EDB, interim measures, RCRA, groundwater sampling, groundwater treatment system operation, granular activated carbon						
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DAVID S. MILLER, Colonel, U.S. Air Force
Commander, 377th Air Base Wing

18 Dec 20
Date

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

17 Dec 20
Date

PREFACE

This Quarterly Monitoring Report – July–September 2020 has been prepared by EA Engineering, Science, and Technology, Inc., PBC (EA) for Kirtland Air Force Base (AFB) under the U.S. Army Corps of Engineers Contract Number W912DR-12-D-0006, Delivery Order DM01 and pertains to Kirtland AFB Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, located in Albuquerque, New Mexico.

This report contains data collected by EA itself as well as from other entities/sources that are not under EA's direct control (collectively "non-EA Data"). All non-EA data reported herein are displayed in the form in which they were received from their source entity, and EA assumes no liability for the accuracy of any non-EA data in this report.

This report was prepared in accordance with applicable federal, state, and local laws and regulations, including the New Mexico Hazardous Waste Act, New Mexico Statutes Annotated 1978, New Mexico Hazardous Waste Management Regulations, Resource Conservation and Recovery Act, and regulatory correspondence between the New Mexico Environment Department Hazardous Waste Bureau and the U.S. Air Force, dated March 25 and May 20, 2016. The work presented in this report was conducted in accordance with Kirtland AFB's Hazardous Waste Treatment Facility Operating Permit Number NM9570024423 and the Class V Underground Injection Well Discharge Permit Number 1839, both issued by the New Mexico Environment Department.

Monitoring of groundwater and drinking water, and operation of the groundwater treatment system were conducted from July 1 through September 30, 2020.

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	microgram(s) per liter
%	percent
AFB	Air Force Base
BFF	Bulk Fuels Facility
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CFR	Code of Federal Regulations
DoD	Department of Defense
DP	Discharge Permit
EDB	ethylene dibromide
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
GAC	granular activated carbon
GCMP	Golf Course main pond
gpm	gallon(s) per minute
GWM	groundwater monitoring
GWTS	groundwater treatment system
IDW	investigation-derived waste
IMOA	Interim Measure Operational Area
KAFB	Kirtland Air Force Base
LNAPL	light non-aqueous phase liquid
MCL	maximum contaminant level
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
No.	number
O&M	operation and maintenance
psi	pound(s) per square inch
PSL	project screening level

LIST OF ACRONYMS AND ABBREVIATIONS (CONCLUDED)

Q1	first quarter of the year, January 1 through March 31
Q2	second quarter of the year, April 1 through June 30
Q3	third quarter of the year, July 1 through September 30
Q4	fourth quarter of the year, October 1 through December 31
QAPjP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
REI	reference elevation interval
SE	Southeast
SVM	soil vapor monitoring
SWMU	Solid Waste Management Unit
TCZ	Target Capture Zone
UIC	underground injection control
USGS	U.S. Geological Survey
VA	Veterans Affairs

EXECUTIVE SUMMARY

The investigation and remediation of the Kirtland Air Force Base (AFB) Bulk Fuels Facility (BFF) release (Solid Waste Management Units [SWMUs] ST-106/SS-111) are being implemented pursuant to the Resource Conservation and Recovery Act (RCRA) corrective action provisions in Part 6 of Kirtland AFB's Hazardous Waste Treatment Facility Operating Permit (Permit Number NM9570024423 [RCRA Permit]) (New Mexico Environment Department [NMED], 2010). This Quarterly Report for the third quarter (Q3) of calendar year 2020 summarizes the activities performed from July 1 through September 30, 2020. These activities include quarterly groundwater monitoring and evaluation of the dissolved-phase ethylene dibromide (EDB) groundwater pump and treat interim measure.

In Q3 2020, 65 groundwater monitoring wells were sampled. Consistent with previous quarters, the highest EDB and benzene, toluene, ethylbenzene, and total xylenes (BTEX) concentrations were detected on Kirtland AFB within the source area. Depths to groundwater were gauged in 165 groundwater monitoring wells during the synoptic gauging event. During gauging, light non-aqueous phase liquid was detected and measured in three of these wells. All three wells were located on-Base within the source area plume (KAFB-106059, KAFB-106150-484, and KAFB-106154-484), consistent with previous quarters.

As part of the interim measure groundwater treatment system (GWTS), groundwater pumped from extraction wells within the dissolved-phase EDB plume was treated at the GWTS located on Kirtland AFB. Groundwater pumped from the extraction wells was conveyed into the GWTS and filtered through two treatment trains containing granular activated carbon. The water flowing into the GWTS during Q3 2020 had concentrations of EDB below the maximum contaminant level of 0.05 micrograms per liter and had no detections of BTEX. While flowing through the granular activated carbon vessels, the EDB was filtered out of the groundwater. During Q3 2020, the GWTS ran for 96.0 percent of the time, treated 65,411,600 gallons of groundwater, and removed an estimated 2.9 grams of EDB. Once the groundwater was treated at the GWTS, it was then pumped to the lined main pond at the Kirtland AFB Tijeras Arroyo Golf Course (55,412,000 gallons) and/or gravity-fed into injection well KAFB-7 (9,999,600 gallons). During Q3 2020, discharged groundwater had no detections of EDB or BTEX.

Fourteen sentinel wells monitored by the U.S. Geological Survey were sampled during Q3 2020. These wells are located between the EDB plume and drinking water wells, which are owned and operated by the Albuquerque Bernalillo County Water Utility Authority and Raymond G. Murphy Veterans Affairs (VA) Medical Center. No contaminants associated with the BFF release were detected. Additionally, three Kirtland AFB drinking water supply wells (KAFB-003, KAFB-015, and KAFB-016) and the VA drinking water supply well (ST106-VA-2) were sampled during Q3 2020. There were no detectable concentrations of analytes in any of the samples analyzed.

Planned activities for the fourth quarter (Q4) 2020 include:

- Sample the soil vapor monitoring points
- Sample the Q4 2020 designated wells and measure depth to water in the groundwater monitoring network beginning in October 2020
- Sample drinking water supply wells for organic compounds on a monthly basis
- Conduct performance assessment modeling for the GWTS
- Operate and perform routine maintenance and monitoring of the GWTS.

1. INTRODUCTION

The investigation and remediation of the Kirtland Air Force Base (AFB) Bulk Fuels Facility (BFF) release (Solid Waste Management Units [SWMUs] ST-106/SS-111) are being implemented pursuant to the Resource Conservation and Recovery Act (RCRA) corrective action provisions in Part 6 of Kirtland AFB's Hazardous Waste Treatment Facility Operating Permit (Permit Number [No.] NM9570024423 [RCRA Permit]) (New Mexico Environment Department [NMED], 2010). This Quarterly Report for the third quarter (Q3) of calendar year 2020 was prepared in accordance with Section 6.2.4.1 of the RCRA Permit, and presents non-cumulative data for Q3 2020, summarizing the activities performed from July 1 through September 30, 2020. The reporting schedule is provided in the Work Plan for BFF Expansion of the Dissolved-Phase Plume Groundwater Treatment System (GWTS) Design (Kirtland AFB, 2017a). Key regulatory correspondence for Q3 2020 is provided in Appendix A-1, and a response to regulator comments is provided as Appendix A-2 in accordance with NMED in the letters dated July 11, 2020 (NMED, 2020a) (Appendix A-1) and September 2, 2020 (NMED, 2020b) (Appendix A-1).

The BFF site is located within the northwestern portion of Kirtland AFB, on the southern end of the city of Albuquerque, as shown on the site location map (Figure 1-1). The Phase I RCRA Facility Investigation (Kirtland AFB, 2018a) provides a detailed site description and history. Ongoing groundwater monitoring (GWM), soil vapor monitoring (SVM), and groundwater interim measures are discussed in this report. Ongoing pilot tests, which are reported under separate cover, are discussed herein only as the data from these pilot tests impact the data from the GWM, SVM, and groundwater interim measures.

1.1 Scope of Activities

The following activities were performed concurrently during Q3 2020:

- Groundwater sampling
- Water level gauging
- Drinking water supply well sampling
- GWTS operation and maintenance (O&M)
- GWTS performance monitoring
- Chemical analytical testing
- Investigation-derived waste (IDW) storage, disposal, and reporting.

The Q3 2020 monitoring program was performed in accordance with multiple work plans: (1) GWM (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c), and (2) drinking water supply well sampling (NMED, 2018a; Kirtland AFB, 2017b). GWTS operations, sampling, and treated effluent discharge were performed in accordance with the O&M Plan (NMED, 2016, 2017b; Kirtland AFB, 2016a, 2017d, 2018b). Field methods are provided in Appendix B-1, and a list of former well designations for cross-reference with historical documentation is provided in Appendix B-2.

In accordance with the approved work plans (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c), SVM occurs semiannually in the second quarter (Q2) and fourth quarter (Q4) and GWM includes additional wells and analytes for semiannual sampling in Q2 and annual sampling in Q4.

1.2 Report Organization

This report is organized as follows:

- Section 1: Introduction
- Section 2: Vadose Zone Monitoring
- Section 3: GWM
- Section 4: Drinking Water Supply Well Monitoring
- Section 5: GWTS Operation and Performance
- Section 6: IDW
- Section 7: Summary
- Section 8: References.

2. VADOSE ZONE MONITORING

No SVM activities were performed during Q3 2020. The SVM program is performed semiannually in Q2 and Q4 of each year (NMED, 2018a). Appendices C and D remain in this report as placeholders; information will be included in these appendices following the semiannual sampling events. The next semiannual SVM event will be performed in Q4 2020.

3. GROUNDWATER MONITORING

At the end of Q3 2020, the BFF GWM well network was comprised of 167 GWM wells (Figure 3-1, Table 3-1, and Table 3-2), including 161 wells that are sampled on a quarterly or semiannual basis, five wells that are gauged but not sampled (KAFB-106148-484, KAFB-106150-484, KAFB-106154-484, KAFB-106155-484, and KAFB-106156-484), and one well that is gauged and will be sampled once the water level rises sufficiently (KAFB-106211). A total of 65 of these wells were sampled in Q3 2020 in accordance with the approved work plans (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c) and the field methods provided in Appendix B-1 (Table 3-3).

Appendices pertinent to GWM are listed below:

- Appendix E-1 Daily Quality Control Reports – Groundwater Sampling
- Appendix E-2 Groundwater and Light Non-Aqueous Phase Liquid (LNAPL) Measurements
- Appendix E-3 Groundwater Purge Logs and Sample Collection Logs
- Appendix E-4 Groundwater Sample Chain-of-Custody Forms
- Appendix E-5 U.S. Geological Survey (USGS) Sentinel Well Data
- Appendix E-6 Descriptions from Previous Reports
- Appendix F-1 Data Quality Evaluation Report – Groundwater Samples
- Appendix F-2 Data Packages – Groundwater Samples
- Appendix F-3 U.S. Environmental Protection Agency (EPA) Data Verification and Validation Figures
- Appendix F-4 Groundwater Analytical Data.

Throughout this report, GWM wells, and their associated groundwater data, are described based on reference elevation intervals (REIs). REIs are below ground surface elevations that divide the GWM network into datasets comprised of wells that are screened across their respective elevations, allowing for a vertical evaluation of groundwater parameters and contaminant locations. Currently, wells are assigned to three REIs (4857, 4838, and 4814) (Figures 3-2, 3-3, and 3-4, respectively). A detailed explanation of how the REIs are defined is provided in Appendix E-6.

Prior to Q4 2018, GWM wells were assigned designations based either on their location related to the groundwater gradient and their spatial relationship to the dissolved-phase ethylene dibromide (EDB) plume or simply on their location (i.e., source area, etc.). In response to the changing regional groundwater gradient (Appendix E-6), well designations are no longer used in figures and analytical results tables. The former well designations and current monitoring well objectives are provided in Table 3-1 along with the current sampling regime by quarter. Detailed descriptions of the former well designations and the frequency of samples collected by designation are provided in Appendix E-6.

In this report, sample results from GWM wells are discussed based on their location (north or south) in relation to Ridgecrest Drive Southeast (SE). The Source Area Plume is located south of Ridgecrest

Drive SE. The Interim Measure Operational Area (IMOA) for the groundwater interim measure is the distal section of the EDB plume located north of Ridgecrest Drive SE (Figure 3-1). The Target Capture Zone (TCZ) is located within the IMOA and is defined in accordance with EPA guidance (EPA, 2008). The definition used by EPA defines the TCZ as the three-dimensional zone of groundwater that must be captured by the remedy extraction wells for the hydraulic containment portion of the remedy to be considered successful. The three-dimensional zone of groundwater that must be captured by the interim measure extraction wells (i.e., the TCZ) is defined as the maximum contaminant level (MCL) for dissolved EDB, 0.05 micrograms per liter (µg/L).

GWM activities included measuring the depths to groundwater and LNAPL (Table 3-2, Figures 3-3 through 3-5) and measuring field parameters in wells sampled with low-flow sampling pumps (Appendix E-3). Field parameter measurements are not part of the passive sampling methodology, as discussed in more detail in Appendix E-6. Groundwater samples were collected and submitted for laboratory analysis from 65 wells in Q3 2020 (Tables 3-4 through 3-6 and Figures 3-6 and 3-7). Field methods are provided in Appendix B-1.

3.1 New Groundwater Monitoring Activities

After four quarters of baseline sampling, newly added wells will be assigned an objective and moved into their relevant sampling regime in the following quarter (Table 3-7), in accordance with the Work Plan for Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling (Kirtland AFB, 2017b). For well KAFB-106S7, baseline sampling was completed in Q3 2020; two additional quarters of sampling this well were performed due to the failure of the sleeve of the passive sampler (Section 3.3.1). There are currently no other monitoring wells undergoing baseline sampling.

3.2 Groundwater and Light Non-Aqueous Phase Liquid Gauging

Depth to water was measured in 165 of the 167 GWM wells between July 20 and 24, 2020 (Figures 3-2 through 3-4 and Table 3-2), using three oil-water interface probes in accordance with the approved work plan (Kirtland AFB, 2017a). Each well was also checked for the presence of LNAPL. Gauging deviations are discussed in Section 3.2.1. Of the 88 GWM wells in REI 4857 gauged in Q3 2020, 32 wells had screens that intersected the current water table, while the remaining 56 wells had submerged well screens. Screen submergence in these 56 wells ranged from 0.39 to 25.55 feet (ft) (KAFB-106012R and KAFB-106025, respectively) (Table 3-2).

The interface probe was checked for proper operation and cable integrity prior to each use and was decontaminated after gauging each well. If LNAPL was detected using the interface probe, a plastic bailer was used to confirm the presence and thickness of the LNAPL. Additionally, during Bennett pump sampling, every well was checked for the presence of LNAPL prior to the installation of the pump. Depths to LNAPL and groundwater were recorded in the field on well gauging forms (Appendix E-2).

Depth to water in the GWM wells was gauged using three oil-water interface probes, each dedicated to groups of wells with similar historical analytical results. Measurement differences from a control probe were calculated in accordance with the methods described in Appendix B-1, and subsequent data corrections are presented in Appendix E-2, Table E-2-2.

3.2.1 Groundwater Gauging Monitoring Results

Groundwater elevations from each REI were used to create potentiometric surface maps (Figures 3-2 through 3-4). Horizontal groundwater gradients within the monitoring network are dominated by a radial flow pattern toward depressions in the water table, which are primarily attributable to groundwater extraction wells.

LNAPL was measured in only three of the 165 wells (KAFB-106059, KAFB-106150-484, and KAFB-106154-484) in Q3 2020 at thicknesses of 0.01, 0.27, and 0.02 ft, respectively (Table 3-2 and Figure 3-5). All three wells with LNAPL are located south of Ridgecrest Drive SE, on-Base, and within the footprint of the Source Area Plume. The location of LNAPL is consistent with previous monitoring events (Table 3-8). There are 10 wells with unsubmerged screens surrounding these wells that did not indicate the presence of LNAPL. These data indicate that the extent of LNAPL was bounded during Q3 2020 (Figure 3-5).

3.2.2 Gauging Deviations

Water level measurements were not obtained from two wells during the Q3 2020 synoptic gauging event. Depth to water in wells KAFB-106063 and KAFB-106064 (Figure 3-1) was not measured during the synoptic gauging event in July due to the presence of dedicated downhole equipment related to the Environmental Security Technology Certification Program pilot test project for EDB in situ biodegradation (Kirtland AFB, 2016b). However, water levels were measured prior to sampling in August and are reported in Table 3-2 for informational purposes only; these data were not used to contour groundwater elevations. The water level was measured in KAFB-106211 approximately 1.2 ft above the bottom of the screen. This well will be added to the sampling network after the water level rises enough to allow for passive sampling (approximately 5 ft of water column).

3.3 Groundwater Sampling

Quarterly groundwater samples were collected from 65 wells in the GWM network between July 6 and 16, 2020, using portable low-flow pump systems or passive sampling methods (Table 3-3). Well locations are shown on Figure 3-1, and sentinel well locations are shown on Figure 3-8. Sentinel wells are wells located between contaminant plumes and extraction wells to provide early detection if contaminants migrate toward the extraction wells. Groundwater samples collected for the Q3 2020 monitoring event were analyzed for EDB; benzene, toluene, ethylbenzene, and total xylenes (BTEX); anions; alkalinity; and metals according to the Q3 sampling regime in Table 3-1 and the analytical suite listed in Table 3-3. Groundwater samples were analyzed by Eurofins Lancaster Laboratories Environmental, LLC located in Lancaster, Pennsylvania, which maintains current Department of Defense (DoD) Environmental Laboratory Accreditation Program certification. Sampling was conducted in accordance with the procedures discussed in Appendix B-1. The groundwater purge and sampling forms are provided in Appendix E-3 and the chain-of-custody forms are provided in Appendix E-4.

3.3.1 Sampling Deviations

During Q3 2020, one well (KAFB-106009) was sampled using the passive sampling method following removal of the failed dedicated Bennett pump. In future sampling events, this well will be sampled using a portable Bennett pump until official written approval to use the passive sampling method is obtained (Appendix A-2). During Q4 2019 and Q2 2020 sampling at newly added well KAFB-106S7-451, there was a failure in the sleeve around the passive sampler, which resulted in insufficient sample volume for the full suite of analytes. Therefore, to achieve four complete sets of baseline analysis, two additional quarters of baseline sampling were conducted.

3.4 Data Review and Usability Results

The Q3 2020 groundwater analytical data underwent EPA 100 percent (%) Stage 3 data validation by an independent third-party subcontractor, Environmental Data Services, Inc., Virginia Beach, Virginia, following data verification. Data verification is performed on a data set to ensure method, procedural, and contractual compliance with project-specific requirements and is typically performed by the contractor responsible for data collection. Data validation is an analyte- and sample-specific process that extends the evaluation of analytical data beyond the data verification process to determine the analytical quality of a specific data set.

Data verification and data validation are sequential steps in a data review process that can be performed by either the contractor collecting the data or an independent third-party subcontractor. For this project, verification is performed by the contractor to ensure compliance with the project Quality Assurance Project Plan (QAPjP), Appendix D of the Work Plan for BFF Expansion of the Dissolved-Phase Plume GWTS and associated QAPjP (Kirtland AFB, 2017a), and is performed during or at the completion of field or laboratory data collection activities. EPA Stage 3 data validation is conducted by Environmental Data Services, Inc. and incorporates the data verification process and further evaluates data quality based on analytical method-specific quality control criteria and DoD Quality Systems Manual requirements as documented in the project QAPjP. Further details regarding EPA data verification and validation processes are documented in Figures 2 and 4 of the Guidance on Environmental Data Verification and Data Validation (EPA, 2002) provided in Appendix F-3.

Subsequent to performing data validation, the data qualifiers were uploaded to the EQuIS® project database. Data were further assessed for accuracy, precision, representativeness, comparability, completeness, and sensitivity and determined to achieve the project data quality objectives in Q3 2020. All groundwater data presented and discussed in this report are final validated data. The Environmental Resources Program Information Management System data deliverable was submitted in October 2020. The Data Quality Evaluation Report for groundwater samples collected in Q3 2020 is provided in Appendix F-1, and the final laboratory data reports are included in Appendix F-2.

3.5 Regulatory Criteria

The project screening levels (PSLs) for hazardous constituents listed in 40 Code of Federal Regulations (CFR) Part 261, Appendix VIII or 40 CFR Part 264, Appendix IX were selected to satisfy the requirements of the Kirtland AFB RCRA Permit (NMED, 2010) as the lower of:

- New Mexico Water Quality Control Commission (NMWQCC) standards per the New Mexico Administrative Code, Title 20.6.2.3103, Standards for Groundwater of 10,000 milligrams per liter Total Dissolved Solids Concentration or Less (New Mexico Administrative Code, 2018). For metals, the NMWQCC standard applies to dissolved metals and total mercury.

- EPA National Primary Drinking Water Regulations, MCLs and secondary MCLs, and Title 40 CFR Parts 141 and 143.

If no MCL or NMWQCC standard existed for an analyte, the PSL used was the EPA Residential Tap Water Regional Screening Level (EPA, 2020).

The analytical method utilized to analyze for total nitrate/nitrite nitrogen concentrations (Method 353.2) cannot identify individual nitrate and nitrite concentrations without modification. Typically, in highly oxidizing and near neutral aquifers, nitrate is the primary nitrogen species found in groundwater

(Langmuir, 1997). Previous studies in the Albuquerque Basin have used total nitrate/nitrite nitrogen concentrations as equivalent to nitrate nitrogen concentrations (Longmire, 2016; Anderholm et al., 1995). Therefore, total nitrate/nitrite nitrogen concentrations were compared to the 10 milligrams per liter MCL for nitrate in this report.

Groundwater MCLs or PSLs for all analytes are provided in the groundwater analytical data tables included in this report (Tables 3-4, 3-5, 3-6, 3-9, and 3-10). In accordance with NMED reporting requirements for all document submittals (NMED, 2020b), analytical results and screening levels are provided in a sortable, searchable format (Appendix F-4).

3.6 Groundwater Analytical Data Results

Groundwater samples collected in 65 GWM wells for the Q3 2020 monitoring event were analyzed for EDB, BTEX, anions, alkalinity, and metals (Table 3-3). Contaminant concentrations were compared to their respective MCLs or PSLs and are discussed in the following sections. The analytical results for field duplicate samples are presented in the tables and were used to assess field and laboratory analytical precision. However, field duplicate results are not discussed in this text for comparison purposes unless otherwise noted and duplicate data are not provided on figures. The results for the duplicate sample analyses are included in the Data Quality Evaluation Report (Appendix F-1).

In this report, sample results from GWM wells are discussed based on their location (north or south) in relation to Ridgecrest Drive SE (Figure 3-1). The Source Area Plume is located south of Ridgecrest Drive SE. The IMOA for the groundwater interim measure is located north of Ridgecrest Drive SE.

Analytical data for both organic and inorganic compounds for the newly added wells are provided in Table 3-4. Data for organic compounds for GWM wells are provided in Table 3-5 and inorganic compounds in Table 3-6. The status of baseline sampling of one newly added well (KAFB-106S7) is provided in Table 3-7. No other wells were classified as newly added in Q3 2020 (Section 3.1). Historical EDB and BTEX results for the previous three samples from the 161 GWM wells sampled either quarterly or semiannually are provided in Tables 3-9 and 3-10, respectively. Groundwater analytical data for this quarter and the previous three quarters are provided in Appendix F-4. Q3 2020 chemical concentrations are depicted on the figures as listed below:

- EDB on Figure 3-6
- BTEX on Figure 3-7.

3.6.1 Organic Compounds Analytical Results

3.6.1.1 EDB Analytical Results

Groundwater samples from 65 wells were analyzed for EDB in Q3 2020 (Table 3-3). Analytical results of EDB are presented in Tables 3-4 and 3-5, and on Figure 3-6.

3.6.1.1.1 EDB Analytical Results North of Ridgecrest Drive SE

Of the 65 wells analyzed for EDB in Q3 2020, 37 were located in the IMOA north of Ridgecrest Drive, SE. There were no EDB detections north of Ridgecrest Drive SE that exceeded the EPA MCL of 0.05 µg/L.

3.6.1.1.2 EDB Analytical Results South of Ridgecrest Drive SE

Of the 65 wells analyzed for EDB in Q3 2020, 28 were located south of Ridgecrest Drive SE in the Source Area. Concentrations of EDB exceeded the EPA MCL of 0.05 µg/L in 10 of these wells, all of which were in REI 4857.

- Six EDB exceedances were observed in wells located on-Base in the immediate vicinity of, or within, the BFF.
- The highest EDB concentration south of Ridgecrest Drive SE was detected in the groundwater sample collected from well KAFB-106S8-451 (310 µg/L).

3.6.1.2 BTEX Analytical Results

Groundwater samples from 24 wells were analyzed for BTEX in Q3 2020 (Table 3-3). These wells are located south of Ridgecrest Drive SE. In accordance with the approved work plans (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c) (Table 3-1), groundwater samples from wells located north of Ridgecrest Drive SE were not analyzed for BTEX in Q3 2020. BTEX analytical results are presented in Tables 3-4 and 3-5, and on Figure 3-7. There were no exceedances of BTEX compounds in sentinel GWM wells in Q3 2020; sentinel well locations are shown on Figure 3-8. BTEX was detected in areas consistent with previous Source Area Plume designations.

- Benzene exceeded the 5.0 µg/L MCL in eight wells located south of Ridgecrest Drive SE (Figure 3-7); these exceedances were in REI 4857. The highest benzene concentration was detected in KAFB-106S8-451 and KAFB-106S1-447 (both 5,000 µg/L) in REI 4857 in the Source Area Plume.
- Toluene exceeded the 1,000 µg/L PSL in six wells located south of Ridgecrest Drive SE (Figure 3-7); these exceedances were in REI 4857. The highest toluene concentration was detected in KAFB-106S1-447 (6,300 µg/L) in the Source Area Plume.
- Ethylbenzene exceeded the 700 µg/L PSL in two wells located south of Ridgecrest Drive SE (Figure 3-7) in REI 4857. The highest ethylbenzene concentration was detected in KAFB-106S5-446 (1,300 µg/L) in the Source Area Plume.
- Total xylenes exceeded the 620 µg/L PSL in seven wells located south of Ridgecrest Drive SE (Figure 3-7); these exceedances were in REI 4857. The highest total xylenes concentration was detected in KAFB-106S7-451 (3,300 µg/L) in the Source Area Plume.
- There were no exceedances of BTEX constituents in either REI 4838 or 4814.

3.6.2 Inorganic Compounds Analytical Results

Inorganic compounds include total metals (arsenic, lead, calcium, magnesium, potassium, and sodium), dissolved metals (iron and manganese), and anions (bromide, chloride, sulfate, and nitrate/nitrite nitrogen). In accordance with the approved work plans (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c), a total of 24 wells were sampled for inorganic compounds in Q3 2020 (Table 3-3). Five of these wells are located north of Ridgecrest Drive SE and 19 are located south of Ridgecrest Drive SE. Inorganic analytical results are presented in Tables 3-4 and 3-6. Inorganic sampling is conducted to assess geochemical aquifer conditions. Inorganic sample results are evaluated and discussed in the Q2 and Q4 reports when sufficient data are collected to evaluate geochemical aquifer conditions.

3.6.3 Sampling Results for U.S. Geological Survey Sentinel Wells

USGS monitors 14 sentinel wells between the Kirtland AFB BFF EDB plume and water supply wells, which are owned and operated by the Albuquerque Bernalillo County Water Utility Authority and Raymond G. Murphy Veteran's Affairs (VA) Medical Center (Figure 3-8). This monitoring is conducted as a means of providing independent observation of water quality in the vicinity of these water supply wells. Samples are collected from these sentinel wells quarterly. For Q3 2020, these samples were collected using dual membrane samplers from July 6 to 9, 2020. The samples were analyzed for volatile organic compounds and EDB by the USGS National Water Quality Laboratory using Method O-4127-96 (Connor et al., 1998). No detections were found in the Q3 2020 samples. The USGS transmittal letter, including the Q3 2020 data results, is provided in Appendix E-5.

3.6.4 Field Parameter Results

Field parameters were collected from 11 wells located south of Ridgecrest Drive SE that were sampled using the low-flow sampling method (Table 3-3), in accordance with the approved work plans (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c). Field parameter data are provided on sample collection logs provided in Appendix E-3.

3.6.5 Bioremediation Indicators

Bioremediation indicators are not assessed in the first quarter (Q1) and Q3 due to the limited data set.

3.7 Groundwater Monitoring Well Network Operation and Maintenance

The GWM well network was inspected to ensure that the condition of all protective covers and wellheads met the intended requirements for performance and security. During the inspection period, cleaning and maintenance were performed and all GWM wells were determined to be fully serviceable.

As of the end of Q3 2020, 94 dedicated Bennett pumps have been removed from the GWM well network. Of these, 77 were removed in Q2 2017 as part of a transition to passive sampling for the monitoring program (NMED, 2017a). In the remaining 17 wells, dedicated Bennett pumps were removed due to pump failure. Eleven of these 17 wells have been sampled using a portable Bennett pump since removal, and six wells will be sampled using a portable Bennett pump until official written approval is obtained for passive sampling. Although several wells are sampled using portable Bennett pumps, ongoing issues with this sampling system continue to arise due to biofouling of wells, corrosion of components, and mechanical failure due to aging parts.

4. DRINKING WATER SUPPLY WELL MONITORING

Three drinking water supply wells (KAFB-003, KAFB-015, and KAFB-016) provide drinking water to on-Base employees and tenants of Maxwell Housing, which is located off-Base. One drinking water supply well (ST106-VA-2) provides drinking water to VA Medical Center patients, employees, and visitors. These drinking water wells are community water systems that are regulated by the NMED Drinking Water Bureau in accordance with the Safe Drinking Water Act.

As part of the monitoring associated with the BFF site, these wells are sampled monthly and analyzed for EDB and BTEX to document that the EDB plume has not impacted these drinking water wells.

4.1 Drinking Water Supply Well Sampling and Analysis Procedures

Drinking water supply wells KAFB-003, KAFB-015, KAFB-016, and ST106-VA-2 were sampled in July, August, and September 2020. Field measurements, sample collection, packaging, shipping, and analyses were performed in accordance with the Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling Work Plan and associated QAPjP (Kirtland AFB, 2017b). Sampling was conducted in accordance with the procedures discussed in Appendix B-1. Daily quality control reports are provided in Appendix G-1. Completed sample collection logs and chain-of-custody forms are provided in Appendix G-2. Drinking water supply samples were collected and submitted for the following analyses:

- EDB using EPA Method 504.1
- BTEX using EPA Method 524.2.

Samples were submitted to Eurofins TestAmerica Laboratories in Savannah, Georgia, for analytical testing. Analytical results were validated by Environmental Data Services, Inc. The Data Quality Evaluation Reports are provided in Appendix H-1. The Eurofins TestAmerica Laboratories Analytical Reports for July, August, and September 2020 are provided in Appendix H-2.

4.2 Data Review and Usability Results

The Q3 2020 drinking water analytical data underwent a 100% Stage 3 data validation performed by Environmental Data Services, Inc., Virginia Beach, Virginia, following data verification. The data verification and validation steps are discussed in detail in Section 3.4.

All data were valid based on necessary criteria, and no data were qualified as rejected. The technical data completeness was 100%. The data met data quality objectives and were appropriate for use in project decision-making. The quality control parameter and data quality indicator (precision, bias [accuracy], representativeness, comparability, completeness, and sensitivity) evaluation results are provided in the Data Quality Evaluation Report and Data Validation Report provided in Appendix H-1. Final validated data are provided in Table 4-1.

4.3 Regulatory Criteria

Analytical data from the drinking water supply wells were compared to drinking water MCLs and Secondary MCLs. The MCLs for drinking water supply wells are established in the EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Parts 141 and 143.

4.4 Drinking Water Supply Well Analytical Results for Q3 2020

No detectable concentrations of EDB or BTEX were observed in the drinking water supply wells samples, consistent with historical results. Analytical results for Q3 2020 are presented in Table 4-1, Figure 4-1, and Appendix H-3. In addition, analytical data from the previous three quarters are provided in Appendix H-3.

5. GROUNDWATER TREATMENT SYSTEM OPERATION AND PERFORMANCE

This section presents Q3 2020 GWTS operations, performance monitoring and EDB removal, system maintenance and expansion, and analysis of the lines of evidence for the GWTS.

Appendices pertinent to GWTS operation and performance are:

- Appendix I-1: GWTS Plant O&M Documentation
- Appendix I-2: New Mexico 811 Line Locate Tickets
- Appendix I-3: GWTS Performance Sample Collection Logs
- Appendix I-4: Data Quality Evaluation Report – GWTS Samples
- Appendix I-5: Data Packages – GWTS Samples.
- Appendix I-6: GWTS Performance Analytical Data.

5.1 Regulatory Criteria

In addition to the operational procedures outlined in the O&M Plan (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b), the GWTS is subject to the terms of Class V Underground Injection Well Discharge Permit (DP) No. 1839 (DP-1839) (NMED, 2017b) for injecting treated groundwater to KAFB-7. DP-1839 became effective on April 28, 2017. Drilling and installation of underground injection control (UIC) well KAFB-106IN2 under DP-1839 occurred in Q3 2020 (Kirtland AFB, 2019). The requirements associated with the conditions of DP-1839 and the location of reporting requirements in this report are summarized in Table 5-1.

5.2 Groundwater Treatment System Operation

The GWTS is part of the interim measure performed pursuant to the corrective action provisions in Kirtland AFB's RCRA Permit. The purpose of the interim measure is to collapse and treat the dissolved-phase EDB plume within the IMOA, located north of Ridgecrest Drive SE. The GWTS includes:

- Four extraction wells (KAFB-106228, KAFB-106233, KAFB-106234, and KAFB-106239)

- Influent conveyance piping

- Two carbon treatment trains (designed for, but not operating at, 800-gallon per minute [gpm] maximum capacity) located within the GWTS building and associated influent conveyance lines

- Effluent conveyance lines discharging to either the Tijeras Arroyo Golf Course main pond (GCMP) or gravity-fed injection well KAFB-7 (Figure 5-1). Kirtland AFB is also permitted to discharge to Tijeras Arroyo under National Pollutant Discharge Elimination System Permit NM0031216 (EPA, 2019). This discharge point will only be used in emergency situations (i.e., GCMP or KAFB-7 are both inoperable).

5.2.1 Groundwater Treatment System Treatment Volumes and Percentage Run Time

5.2.1.1 Quarterly Run Time

For the purpose of run time evaluation, GWTS operation is defined as the time when groundwater was being pumped from at least one extraction well and subsequently treated and discharged. Table 5-2 provides a monthly and quarterly summary of the extraction well performance, including individual extraction well run times.

During Q3 2020, the GWTS treated 65,411,600 gallons of groundwater; 55,412,000 gallons was discharged to the GCMP, and 9,999,600 gallons was discharged to injection well KAFB-7. During Q3 2020, Trains 1 and 2 treated 41,380,700 and 24,030,900 gallons, respectively. Table 5-3 provides a cumulative summary of groundwater quantities extracted, treated, and discharged.

From July 1 through September 30, 2020, the GWTS was operational 96.0% of the time (Table 5-2). Planned and unplanned system shutdowns affecting GWTS overall run time during Q3 2020 are described in Sections 5.3.1 and 5.3.3.

5.2.2 Extraction Well Performance Metrics

The following subsection provides a summary of the performance metrics for the four extraction wells. Quarterly extraction well performance data required for DP-1839 reporting compliance are provided in Table 5-1. Average operational extraction flow rates do not include flow rates during downtime. Well performance figures are provided in Appendix I-1.

5.2.2.1 Quarterly Extraction Rates

Extraction wells are prioritized for pumping based on their impact on the TCZ and protection of the municipal water supply wells. Wells KAFB-106228 and KAFB-106239 are the highest priority as they have the greatest impact on the reduction of the TCZ based on GWTS performance monitoring and wellhead sampling results. Well KAFB-106234 is the next highest priority as it serves as a distal plume capture well between the TCZ and municipal water supply wells to the northeast. Well KAFB-106233 has minimal impact on TCZ reduction based on wellhead sampling results and is, therefore, the most likely to be deprioritized.

Water was extracted from KAFB-106228 during Q3 2020 at an average operational flow rate of 142.5 gpm with a run time of 95.7% (Table 5-2).

Water was extracted from KAFB-106234 during Q3 2020 at an average operational flow rate of 174.4 gpm with a run time of 95.8% (Table 5-2).

Water was extracted from KAFB-106239 during Q3 2020 at an average operational flow rate of 72.7 gpm with a run time of 94.6% (Table 5-2).

Water was extracted from KAFB-106233 during Q3 2020 at an average operational flow rate of 164.1 gpm with a run time of 78.1% (Table 5-2).

5.2.3 Injection Well Performance Metrics

Quarterly injection well performance data required for DP-1839 reporting compliance are provided in Table 5-4. Injection well performance figures are provided in Appendix I-1.

Groundwater was injected into KAFB-7 during Q3 2020 at an average operational flow rate of 638.6 gpm with a run time of 26.1% (Table 5-4).

5.3 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal

GWTS performance monitoring is performed in conformance with the most recently approved Work Plan (Kirtland AFB, 2017a) as well as Appendix L of the O&M Plan, Sampling and Analysis Plan, and any subsequent revisions. DP-1839 provides additional sampling criteria. Table 2 of DP-1839 provides a list of the contaminants of concern that are most frequently monitored at the GWTS (NMED, 2017c). Q3 2020 GWTS analytical performance metrics and EDB mass removal are discussed in the following sections.

5.3.1 Quarterly Sampling and Analytical Results

Water samples from Train 1 (KAFB-106233 and KAFB-106234) and Train 2 (KAFB-106228 and KAFB-106239) were collected monthly from the untreated influent (sample identifications GWTS-BFF-INF1 and GWTS-BFF-INF2), from a port located after the initial granular activated carbon (GAC) vessel (sample identifications GWTS-BFF-GAC1 and GWTS-BFF-GAC2) but before the final GAC vessel, and from the treated effluent (sample identifications GWTS-BFF-EFF1 and GWTS-BFF-EFF2) in Q3 2020. These samples were analyzed for EDB, BTEX, and dissolved iron and manganese. In previous reports, the samples collected between the two GAC vessels were referred to as post-GAC samples but will hereafter be referred to as mid-GAC samples to clarify that they are not effluent samples. EDB concentrations and mass removal for Q3 2020 are summarized in Table 5-5. Sample results and effluent discharge limits are provided in Table 5-6 for Train 1 and Table 5-7 for Train 2. GWTS performance sample collection logs are provided in Appendix I-3 and analytical data for this quarter and the previous three quarters are provided in Appendix I-6.

In addition to above mentioned samples, samples were collected from both Train 1 and Train 2 to satisfy annual influent and effluent sampling requirements as provided in Table 3 of the DP. The samples were analyzed for semivolatile organic compounds, anions (chloride, sulfate, nitrate, and nitrite), and total phenol, in addition to the routine monthly analytes. Annual samples were collected in July 2020 from the GWTS influent and effluent. Results for the annual samples collected from both trains in July 2020 are provided in Table 5-8. Influent and effluent samples collected for annual analysis had detectable anions (chloride, sulfate, and nitrite-nitrates) at concentrations below the respective PSLs (Table 5-8) from both treatment trains. Low-level detections of semivolatile organic compounds (1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and pyrene) were reported in the influent and effluent samples of Train 1. As a result, the influent and effluent ports of Train 1 were resampled for these analytes in August 2020. The results from the resampling indicate that there were no detections of the semivolatile organic compounds (Table 5-8). Volatile organic compounds and phenols were not detected in any of the samples collected. Results for the annual samples indicate no significant changes in the concentrations of the contaminants of concern since the 2019 annual samples were collected (Kirtland AFB, 2020). GWTS performance sample collection logs are provided in Appendix I-3. GWTS performance sample collection logs are provided in Appendix I-3.

In Q3 2020, an estimated 440 milligrams of EDB was captured in the initial GAC vessel and removed by Train 1, and 2,430 milligrams of EDB was captured in the initial GAC vessel and removed by Train 2. Quantities of mass were calculated by taking the sum of each monthly influent concentration multiplied by the respective total weekly treated volume (Table 5-5).

Concentrations of EDB were not detected in the influent samples of Train 1 in July or August 2020, but were detected in the influent sample of Train 1 below the 0.05 µg/L MCL at an estimated concentration of 0.012 J µg/L in September 2020 (Table 5-6). Concentrations of EDB were detected in the influent samples of Train 2 below the 0.05 µg/L MCL at a concentration of 0.029 µg/L in July 2020, and at estimated concentrations of 0.028 J and 0.024 J µg/L in August and September 2020, respectively (Table 5-7). The J-qualifier denotes that the analyte was identified, but at a low enough concentration that the associated numerical value is estimated. BTEX was not detected in influent samples collected from either train during Q3 2020.

Dissolved manganese was detected below the PSL in monthly influent samples collected from Train 2 in Q3 2020 but was not detected in the influent samples collected from Train 1 during Q3 2020 (Tables 5-6 and 5-7). Dissolved iron was not detected in monthly influent samples collected from either Train 1 or Train 2 (Tables 5-6 and 5-7).

Concentrations of BTEX, dissolved iron, and manganese were non-detect in mid-GAC and effluent monthly samples collected from both Trains 1 and 2 during Q3 2020 (Tables 5-6 and 5-7). Concentrations of EDB were detected in the mid-GAC sample of Train 1 at estimated concentrations of 0.010 J and 0.021 J µg/L in July and September 2020, respectively (Table 5-6). Concentrations of EDB were detected in the mid-GAC sample of Train 2 at estimated concentrations of 0.011 J and 0.015 J µg/L in July and September 2020, respectively (Table 5-7). Under DP-1839, GAC changeouts are not required until mid-GAC concentrations of EDB reach or exceed 90% of the MCL of EDB (0.05 µg/L) but may occur at lower detected concentrations based on professional judgement.

A concentration of EDB was detected in the effluent samples of Train 2 below the 0.05 µg/L MCL at an estimated concentration of 0.013 J µg/L in September 2020 (Table 5-7). This result was considered rejected data based on professional judgement (not usable to achieve project objectives) due to comparability to the field duplicate sample collected the same day. In addition, EDB was not detected from this location in a subsequent sample collected on October 1, 2020. Laboratory reports for these samples are provided in Appendix I-5. Under DP-1839, mid-GAC and effluent concentrations will continue to be sampled monthly, and GAC changeouts will occur when mid-GAC concentrations of EDB reach or exceed 90% of the MCL of EDB (0.05 µg/L) or at lower detected concentrations based on professional judgement.

5.3.2 Data Review and Usability Results

The GWTS analytical data from Q3 2020 underwent EPA Stage 3 data validation by Environmental Data Services, Inc., Virginia Beach, Virginia, following data verification. The data verification and validation steps are discussed in detail in Section 3.4.

Upon completion of the verification and validation process, the data were assessed for accuracy, precision, representativeness, comparability, completeness, and sensitivity to determine if the project data quality objectives were achieved and deemed usable for their intended purpose. The data validation results are included in the Data Quality Evaluation Report provided in Appendix I-4 and the final laboratory data reports provided in Appendix I-5.

5.4 Groundwater Treatment System Maintenance and Expansion Activities

Q3 2020 maintenance activities at the GWTS were performed in accordance with the O&M Plan (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b) and are discussed in the following sections.

5.4.1 Routine Maintenance Activities

Routine maintenance is any activity described as such in the GWTS O&M Plan (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b). A summary of routine maintenance activities is provided below.

5.4.1.1 Quarterly Routine Maintenance Activities

During Q3 2020, effluent and influent bag filters were not replaced on either Train 1 or Train 2 as neither reached the differential pressure required for replacement (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b). The differential pressure at the initial GAC vessel on Train 1 was 2.0 pounds per square inch (psi) on July 1, 2020; and, on September 30, 2020, the differential pressure was 2.3 psi (Appendix I-1). The differential pressure at the initial GAC vessel on Train 2 was 4.5 psi on July 1, 2020; and, on September 30, 2020, the differential pressure was 4.8 psi.

The influent basket strainers were cleaned 15 times for Train 1 and 15 times for Train 2 throughout Q3 2020. The effluent Wye-strainers were cleaned two times for both Train 1 and Train 2 throughout Q3 2020. Wye-strainers/basket strainers were cleaned to maintain equalization of the influent tanks and prevent cavitation at the influent pump intakes. The Wye-strainers/basket strainers accumulate biologic materials coming in with the influent.

The GWTS routine maintenance schedule is provided in Table 5-9 and non-routine maintenance activities that were performed during Q3 2020 are discussed in Section 5.3.3 and in Table 5-9.

5.4.2 Conveyance Line Security and Administrative Controls

Kirtland AFB is registered as a line-owner with New Mexico 811 for the off-Base portion of the conveyance lines. U.S. Air Force permits are required for all on-Base excavation projects.

5.4.2.1 Quarterly Conveyance Line Security

During Q3 2020, Kirtland AFB responded to six off-Base tickets requested through New Mexico 811 (Appendix I-2). There were no conveyance line breaches and all off-Base conveyance lines remained intact.

5.4.3 Non-Routine Maintenance Activities

Non-routine maintenance activities are defined as maintenance items that fall outside of the scope of the GWTS O&M Plan (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b) but need to be addressed in order to maintain consistent GWTS operation. A summary of shutdowns associated with non-routine maintenance activities occurring during Q3 2020 is provided on Table 5-10. Major non-routine maintenance performed in Q3 2020 is listed below.

5.4.3.1 Quarterly Non-Routine Maintenance Activities

On July 3, 2020, the Train 2 Influent tank level transmitter failed. It was replaced on July 15, 2020.

Extraction well KAFB-106239 was disinfected on September 10, 2020 to mitigate bacterial growth and biofouling, and to increase well efficiency. Extraction well disinfection was performed in accordance with the Standard Operating Procedure provided as Appendix R to the O&M Plan (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b). The Standard Operating Procedure was approved by NMED on August 6, 2018 (NMED, 2018b). The analytical sampling suites for pre-treatment and post-treatment groundwater samples were approved on November 16, 2018 (NMED, 2018c).

Pre- and post-treatment samples were analyzed for bromate and chlorite using EPA Method E300.1. Perchlorate was analyzed using EPA Method E331.0. Bromate and chlorite were not detected in either sample. Perchlorate was detected at concentrations ranging from 0.16 to 0.18 μg/L, below the PSL of 14 μg/L, in both samples (Appendix I-1, Table I-1-5). Groundwater from the Middle Rio Grande Basin has naturally occurring perchlorate concentrations ranging from 0.12 to 1.8 μg/L (Plummer et al., 2006).

5.4.3.2 Injection Well Maintenance

Maintenance on UIC well KAFB-7 was completed in Q3 2020. The maintenance report is provided as Appendix I-7.

KAFB-7 was both mechanically cleaned and disinfected between May 27 through June 8, 2020. Well rehabilitation activities included removal/reinstallation of injection pipe, cleaning of iron oxide buildup on an 8-inch louvered injection pipe, mechanical well rehabilitation, video surveying, disinfection, and placement of gravel to stabilize a potential breach in the 12-inch liner. These activities were performed to ensure the well remained as a functional effluent discharge location for treated water from the GWTS. Routine well rehabilitation and maintenance activities were performed in accordance with the O&M Plan (NMED, 2016; Kirtland AFB, 2016a, 2017d, 2018b).

KAFB-7 construction activities were initiated on June 15, 2020 after well rehabilitation was performed. Downhole equipment reinstallation was completed on July 17, 2020. Construction activities consisted of expansion of the concrete pad and freeze-proof enclosure, modifying/replacing equipment, and re-plumbing of equipment into an above-grade configuration. Newly installed equipment, which includes a new pressure sustaining valve, V-Cone flow meter, and actuating valve, were programmed to interface with the GWTS supervisory control and data acquisition and human machine interface. KAFB-7 construction activities were performed to aid future service of the well components. Condition B22 of DP-1839 requires the reporting of UIC well rehabilitation. Condition B19 requires reporting these results in the quarterly report.

5.4.4 Effluent Conveyance Line Integrity

Final retesting of the effluent conveyance line between the GWTS and KAFB-7 was performed on July 14, 2020. The initial pressure reading after the 30-minute makeup period was 50.02 psi. After 1 hour, the pressure reading was 42.76 psi, indicating a difference of 7.26 psi. Because the final pressure was within 30% of the initial pressure, the test was a success. No leaks were detected.

This pressure test was performed pursuant to Condition A15 of DP-1839 requiring the demonstration of the structural integrity of the effluent conveyance system between the GWTS and the UIC well (KAFB-7). Documentation for this pressure test can be found in Appendix I-1.

6. INVESTIGATION-DERIVED WASTE

During Q3 2020, both hazardous and non-hazardous IDW were generated. Non-hazardous IDW consisted of liquids that were sourced from GWM, well rehabilitation operations, and drilling activities. Liquid hazardous waste was generated during routine GWM activities and well rehabilitation work performed during the quarter. There was no drilling-related solid IDW generated or disposed of during Q3 2020.

In addition to the IDW generated specifically during Q3 2020, non-hazardous IDW generated during Q4 2019 and Q2 2020 from GWM activities was managed during Q3 2020. This section discusses the details of waste generated, disposed of, and managed during the quarter.

6.1 Non-Hazardous Investigation-Derived Waste

Non-hazardous IDW liquids comprised the majority of waste volume generated during the quarter. This waste was generated from quarterly GWM sampling and well rehabilitation activities. Appendices J-1 and J-2 provide specific information regarding the non-hazardous liquid and solid IDW generated and disposed of during Q3 2020.

6.1.1 Groundwater Monitoring Liquid Investigation-Derived Waste

Non-hazardous IDW purge water collected during sampling of the GWM wells was placed in 55-gallon plastic (poly) drums. The drums were sealed with matching plastic lids with steel, locking-ring collars, labeled with vinyl non-hazardous waste labels, and transferred to the designated non-hazardous IDW yard located on Kirtland AFB. Small volumes of IDW water, typically generated from the sampling of passive sampling devices or sampling of drinking water wells, were placed in labeled, 5-gallon plastic buckets (pails) with sealing lids.

Eligibility for discharge of non-hazardous liquid IDW to the GWTS was determined by comparing historical, well-specific data from the previous two quarters to the acceptance criteria of the GWTS. Liquid IDW from monitoring wells that had historically met the GWTS acceptance criteria was discharged to the facility without further review. Liquid IDW sourced from wells with historical data from the previous two quarters that exceeded the GWTS acceptance criteria was held for further evaluation.

For Q3 2020, a total of 410.9 gallons of non-hazardous water was generated. This total was comprised of 379.4 gallons of water sourced from standard GWM activities and 31.5 gallons of fluid obtained from equipment calibration/rinsate activities. In all cases, the water met the GWTS acceptance criteria and was processed through the GWTS. All IDW water processed through the GWTS was discharged to the GCMP (Appendix J-1, Table J-1-1). Details of the non-hazardous liquid IDW generated from other sources that were collected and disposed of during Q3 2020 are provided in Table J-1-2 in Appendix J-1.

Any liquid IDW that is collected, but not yet processed through the GWTS, is temporarily accumulated in the "Pending Disposal" area of the IDW yard. Typically, this category includes non-hazardous purge water generated during the quarter that meets GWTS acceptance criteria, but was held due to GWTS discharge limitations, O&M activities, or pending disposal approvals. By the end of Q3 2020, no GWM purge water was being held in the "Pending Disposal" category (Appendix J-1, Table J-1-3).

Any liquid IDW that is collected, but held pending receipt and evaluation of analytical data, is placed in the "Pending Analysis" area of the IDW yard. By the end of Q3 2020, no liquids were being held in the "Pending Analysis" area of the IDW yard. (Appendix J-1, Table J-1-4).

6.1.2 Non-Hazardous Drilling Liquid Investigation-Derived Waste

During Q3 2020, a new injection well (KAFB-106IN2) was being installed to support treated groundwater discharges from the GWTS. Approximately 40,000 gallons of non-hazardous drilling mud was generated and disposed of from this operation during the quarter. The drilling mud was collected by American Service Industries (American Pumping) and disposed of at a permitted facility located in Bosque Farms, New Mexico (Appendix J-1, Table J-1-5).

6.1.3 Non-Hazardous Well Drilling Liquid Investigation-Derived Waste Pending Disposal

There was no well drilling liquid IDW held as "Pending Disposal" at the end of Q3 2020.

6.1.4 Non-Hazardous Solid Waste

There was no non-hazardous, non-routine (GWTS maintenance) solid waste generated or disposed of during Q3 2020 (Appendix J-2, Table J-2-1).

Routine, non-hazardous disposable solid wastes were generated during GWM activities. These included single-use dual membrane samplers, disposable in-line filters, nitrile gloves, and paper trash. These items were disposed of as municipal solid waste and volumes were not tracked.

6.1.5 Non-Hazardous Well Drilling Solid Investigation-Derived Waste

During Q3 2020, there was no non-hazardous solid IDW (soil) disposed of during the quarter (Table J-2-2a). Injection Well KAFB-106IN2 was located in a clean area of Kirtland AFB; therefore, soil cuttings generated during the drilling of KAFB-106IN2 were placed in a holding area. The clean cuttings will be utilized for onsite fill material upon completion of the installation project. There was no soil or mud waste generated from well drilling activities held as "Pending Disposal" at the end of Q3 2020.

6.1.6 Special Waste Well Drilling Solid Investigation-Derived Waste

Special waste is defined as petroleum-contaminated soil that has total petroleum hydrocarbon concentrations greater than 100 milligrams per kilogram (Subparagraph [i] of Paragraph [13] of Subsection S of 20.9.2.7 New Mexico Administrative Code [2011]). No special waste was generated or disposed of during Q3 2020 (Appendix J-2, Table J-2-2b). No special waste was held in "Pending Disposal" areas of the IDW yard at the end of Q3 2020.

6.2 Hazardous Investigation-Derived Waste

Hazardous or suspected hazardous IDW is accumulated in one of two RCRA less than 90-day accumulation areas associated with the Kirtland BFF Project. Hazardous waste generated from routine GWM sampling or well maintenance activities (purge, well development, or well rehabilitation water) is placed in the Kirtland AFB BFF RCRA less than 90-day accumulation area. Hazardous or suspected hazardous waste generated during drilling activities is held in the Kirtland AFB Zia Park temporary RCRA less than 90-day accumulation area. No solid hazardous or suspected hazardous waste was generated during Q3 2020.

Prior to the start of each quarterly GWM sampling event, a preliminary evaluation is made to identify monitoring wells that are anticipated to generate characteristically hazardous liquid IDW for initial waste segregation purposes. Based on historical analytical data available for each well, the water is suspected to be characteristically hazardous if the concentration of benzene exceeded 500 µg/L (per 40 CFR Part 261.24) in either of the previous two sampling events. Liquid IDW from these wells is managed as a potentially characteristically hazardous waste pending confirmation from laboratory analytical results. The hazardous waste classification code for benzene is D018.

For monitoring wells located in the source area of the groundwater plume that show consistent data that indicate purge water is hazardous, "Generator Knowledge" is used for hazardous waste determination. Use of generator knowledge to determine if solid waste is hazardous is permitted under RCRA regulations 40 CFR 262.11(d)(1).

All liquid hazardous waste (purge or well development water) is placed in 55-gallon steel drums with steel tops and locking rings (UN designation 1A2/Y1.2/100/**). When small volumes (less than 5 gallons) of waste is generated at a well, a plastic container with threaded top (jerrican) is used to contain the liquid. The jerrican is then placed in a steel, 55-gallon drum for more secure storage. All waste containers are properly labeled, sealed, and placed on secondary containment pallets located within the appropriate less than 90-day accumulation area. The accumulation areas and waste containers are inspected on a weekly basis by trained personnel as required under 40 CFR 262.34.

Upon receipt of analytical data, the IDW remains in the less than 90-day accumulation area if confirmed to be a hazardous waste. If the IDW is determined to not meet hazardous criteria based on analytical data, the non-hazardous waste is transferred to the "Pending Disposal" area of the non-hazardous IDW yard.

All hazardous waste must be removed from Kirtland AFB and properly disposed of off-Base within the required 90-day accumulation time limit. Hazardous waste is transported off Kirtland AFB after it is properly profiled, manifested, and approved for transport by the Kirtland AFB Hazardous Waste Management Group. Waste is transported by a licensed hazardous waste hauler to a permitted treatment, storage, and disposal facility.

When possible, liquid hazardous waste may be consolidated. This is typically done to combine small volumes of waste generated during passive sampling activities at multiple well sites. Consolidation is also performed to reduce the total number of drums that require offsite disposal. Appendix J-3 provides specific information regarding the hazardous liquid waste disposed of during Q3 2020.

6.2.1 Hazardous Investigation-Derived Waste Volume Q3 2020

During Q3 2020, hazardous purge water was generated from GWM and well rehabilitation activities. A small volume of hazardous purge water generated from well rehabilitation activities in Q2 2020 was also managed in Q3 2020 (Appendix J-3, Table J-3-1). A total of eight drums of hazardous waste were held in the BFF less than 90-day accumulation area at one point during the quarter. The hazardous liquids were consolidated into five, 55-gallon drums prior to disposal. Passive monitoring methods generate a small volume of hazardous waste per well. Consolidation of waste is performed to minimize the number of containers required for offsite disposal. This activity is a routine waste management activity.

A total of 191 gallons of hazardous waste was disposed of from the BFF less than 90-day accumulation area by the end of Q3 2020 (Appendix J-3, Table J-3-1). Waste generated from well rehabilitation activities can include development water, solids such as sand/mud, and/or LNAPL. Drums that contained water with soil and/or LNAPL were segregated and properly profiled prior to disposal.

All hazardous waste was removed from the less than 90-day accumulation area for disposal on September 14, 2020 by Clean Earth under Manifest No. 01303813 FLE (Appendix J-3, Table J-3-1). There were no drums of hazardous water held in the BFF less than 90-day accumulation area at the end of Q3 2020 (Appendix J-3, Table J-3-2).

6.2.2 Hazardous Investigation-Derived Waste Volume Quarterly Totals

For the calendar year 2020, Table J-3-3 in Appendix J-3 provides a cumulative total of hazardous waste disposed of from the Kirtland AFB BFF project. As of Q3 2020, a total of 256 gallons has been manifested and properly disposed of in 2020.

7. SUMMARY

7.1 Discussion and Conclusions

Monitoring conducted in Q1 and Q3 is reduced in scope as compared to Q2 and Q4 as specified in the approved work plan (NMED, 2017a, 2018a; Kirtland AFB, 2017a, 2017b, 2017c). The periodic monitoring reports prepared for Q1 and Q3 focus primarily on presenting the data obtained during the quarter, while more thorough conclusions and trend analyses are provided with the Q2 and Q4 reports when a more complete data set is available. A brief discussion is provided here to summarize the results obtained during Q3 2020, which were consistent with previous quarters.

7.1.1 Groundwater Monitoring

Depth to water was measured in 165 GWM wells between July 20 and 24, 2020 (Section 3.2). Gauging data including groundwater elevations and LNAPL thickness, are provided on Table 3-2. Groundwater horizontal gradients in Q3 2020 were dominated by a radial flow pattern toward groundwater extraction wells (Figures 3-2 through 3-4). Changes in groundwater elevations and flow direction are evaluated in the Q2 and Q4 reports.

During gauging, LNAPL was detected and measured in three wells located on-Base within the source area plume (KAFB-106059, KAFB-106150-484, and KAFB-106154-484), consistent with previous quarters (Table 3-8). Figure 3-5 shows the locations where LNAPL was measured. There are 10 wells with unsubmerged screens surrounding these wells where LNAPL was not detected. These data indicate that the extent of LNAPL was bounded during Q3 2020 (Figure 3-5). Additional discussion of historical LNAPL detections is included in the Q2 and Q4 reports.

Water quality field measurements for the current and previous three quarters are provided in Table E-3-1 of Appendix E and are discussed in more detail in the Q2 and Q4 reports.

Quarterly groundwater samples were collected from 65 GWM wells between July 6 and 16, 2020 (Section 3.3). Groundwater analytical results for Q3 2020 are provided in Tables 3-4 through 3-6 and include comparison to the PSLs. EDB and BTEX results are shown on Figures 3-6 and 3-7. Consistent with previous quarters, the EDB and BTEX concentrations that exceeded the PSLs were observed in the Source Area Plume (Tables 3-8 and 3-9). Concentrations of EDB within the IMOA were below the PSL. Plume delineation and trend analysis are included in the Q2 and Q4 reports. Analytical results for inorganic compounds are provided in Tables 3-4 and 3-6 and are discussed in more detail in the Q2 and Q4 reports when a more complete data set is available.

7.1.2 Drinking Water Supply Well Monitoring

Drinking water supply well analytical data are provided in Table 4-1, including a comparison to the EPA MCLs and Secondary MCLs. No detectable concentrations of EDB or BTEX were observed in the drinking water supply wells samples (Appendix H-3).

7.1.3 Groundwater Treatment System Operation and Performance

During Q3 2020, the GWTS operated 96.0% of the time, and treated 65,411,600 gallons of groundwater, which was discharged to the GCMP and UIC well KAFB-7 (Table 5-3). In Q3 2020, an estimated 2,870 milligrams of EDB was removed by the GWTS (Table 5-5).

Analytical results and effluent discharge limits for monthly water samples from the GWTS are provided in Tables 5-6 and 5-7. Effluent concentrations for both treatment trains were below the laboratory reporting limit during Q3 2020.

Analytical results for annual influent and effluent GWTS samples are provided in Table 5-8. Results for the annual samples indicated no significant changes in the concentrations of the contaminants of concern since the 2019 annual samples were collected (Kirtland AFB, 2020).

7.2 Data Gaps

In December 2008, the San-Juan Chama Drinking Water Project became operational. Since that time, the Albuquerque Bernalillo County Water Utility Authority has met its water needs with a combination of surface water from the Rio Grande and groundwater (Albuquerque Bernalillo County Water Utility Authority, 2016). As groundwater withdrawal from the regional aquifer was reduced, the water table in the vicinity of SWMUs ST-106/SS-111 began to rise. As a result, existing well screens that were installed to span the water table became fully submerged. This resulted in a reduction of unsubmerged well screen monitoring points at the water table.

In 2018 and 2019, 15 additional nested wells were added to the GWM network to compensate for future water table rise. An additional six nested wells are currently in the process of being installed in Q4 2020 and Q1 2021. In 2017, five existing wells, which were historically dry were added to the GWM network due to the rising water table (KAFB-106041, KAFB-106149-484, KAFB-106151-484, KAFB-106152-484, and KAFB-106153-484). One existing well (KAFB-106211) will be added to the GWM network once water level has risen sufficiently to perform passive sampling (approximately 5 ft of water column). The status of this data gap will be reassessed after sampling begins on the new wells scheduled for installation in Q4 2020 and Q1 2021.

Additional analysis of data gaps will be included in Q2 and Q4 reports.

7.3 Recommendations

It is recommended that monitoring and GWTS operation continue in accordance with the schedules provided in the approved work plans (Section 1.1).

7.3.1 Projected Activities for Q4 2020

Q4 2020 will comprise the period between October 1 and December 31, 2020. Planned Q4 2020 activities are summarized below.

Vadose Zone Monitoring

- Perform semiannual SVM in Q4 2020.

Groundwater Monitoring

- Perform and report on quarterly GWM in Q4 2020.
- Report quarterly monitoring of USGS sentinel wells (by USGS).

Drinking Water Supply Well Monitoring

- Perform drinking water supply well monitoring monthly for organic compound analysis for the four wells sampled, and once for semi-annual inorganic compound analysis.

Groundwater Treatment System Operation

- Continue operating the GWTS and extraction wells KAFB-106228, KAFB-106233, KAFB-106234, and KAFB-106239.

- Perform GWTS well disinfection as required.

- Complete performance assessment of the GWTS extraction system.

- Bring UIC KAFB-106IN2 on-line.

Reporting

- Prepare a quarterly report to detail the activities conducted during the quarter, including complete incorporation of NMED comments on quarterly reports dated July 11, 2020 (NMED, 2020a) (Appendix A-2).

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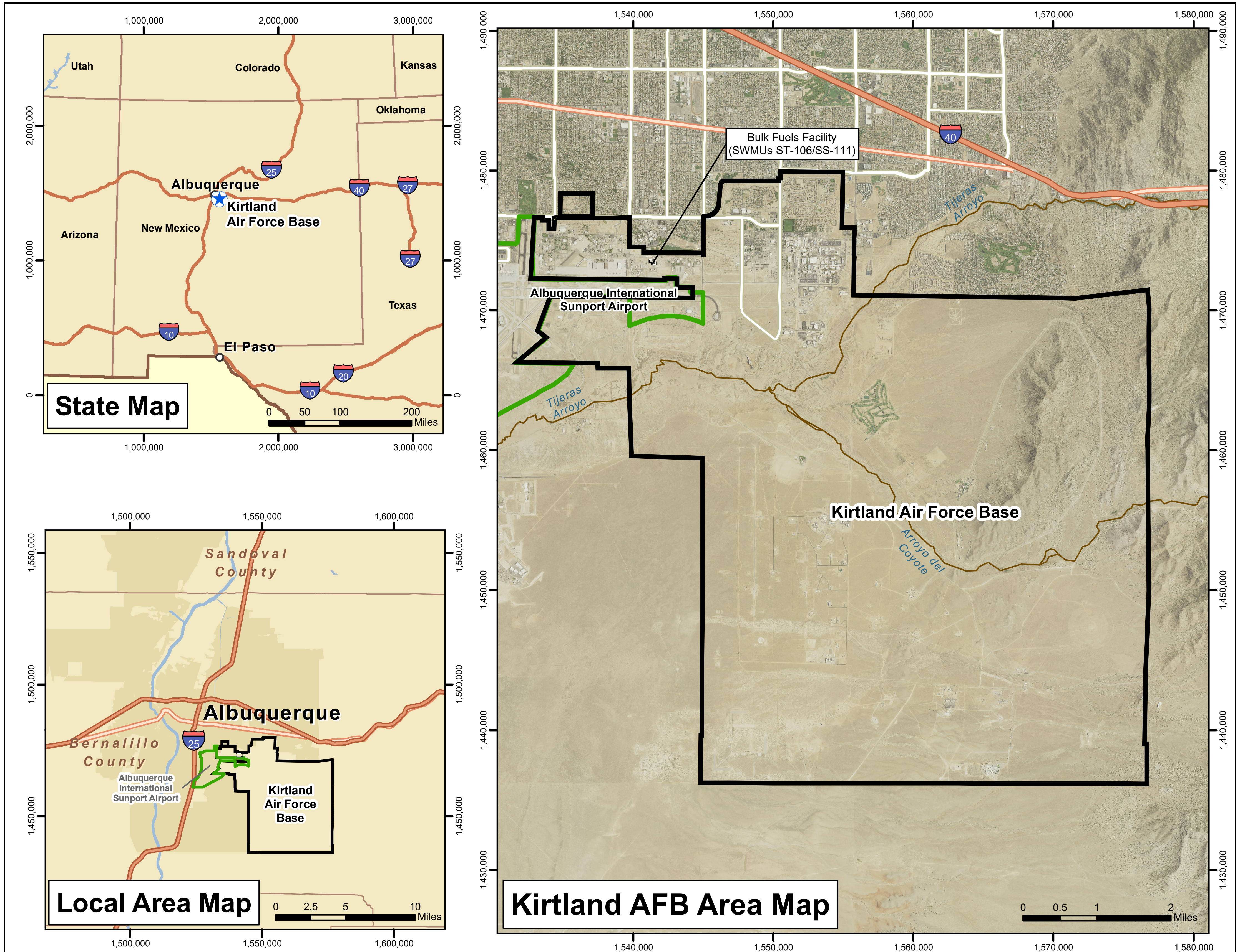
FIGURES



Legend

- Kirtland Air Force Base Installation Boundary
- Albuquerque International Sunport Airport
- Major Highways
- Highways
- Major Roads
- Arroyos
- Rivers
- Source Area

N

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

QUARTERLY REPORT
JULY - SEPTEMBER 2020
BULK FUELS FACILITY
SOLID WASTE MANAGEMENT UNITS ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 1-1

SITE LOCATION MAP

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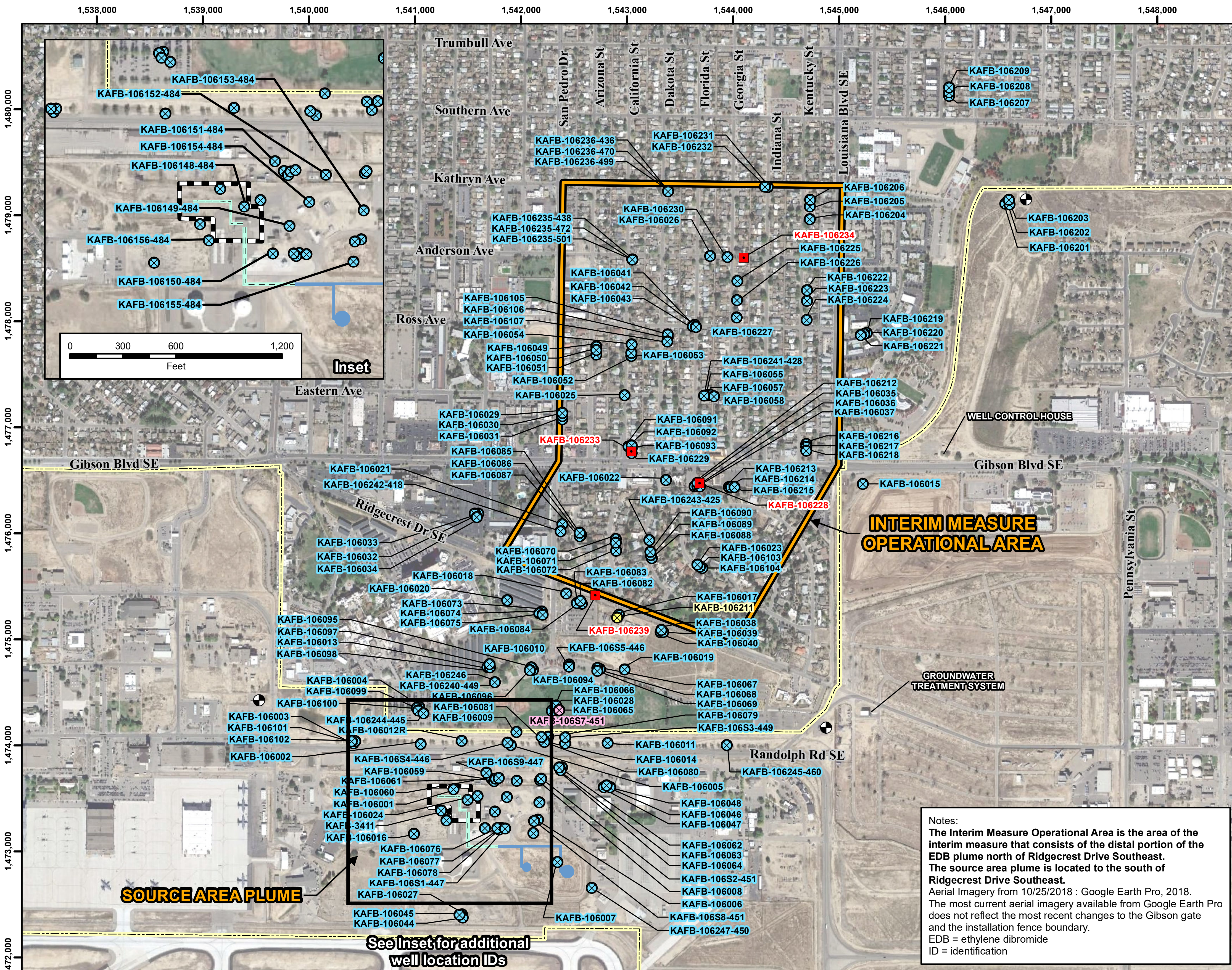
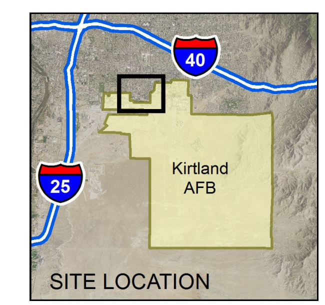


Legend

- Groundwater Monitoring Well
- Extraction Well
- Drinking Water Supply Well
- Monitoring Well (pending water table rise)
- Newly Added Monitoring Well
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Interim Measure Operational Area
- Source Area



N

0 500 1,000 2,000

Feet

1 inch = 1,000 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
EDB = ethylene dibromide
ID = identification

QUARTERLY REPORT
JULY - SEPTEMBER 2020
BULK FUELS FACILITY
SOLID WASTE MANAGEMENT UNITS ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 3-1

GROUNDWATER MONITORING NETWORK, DRINKING WATER SUPPLY WELL, AND EXTRACTION WELL LOCATIONS

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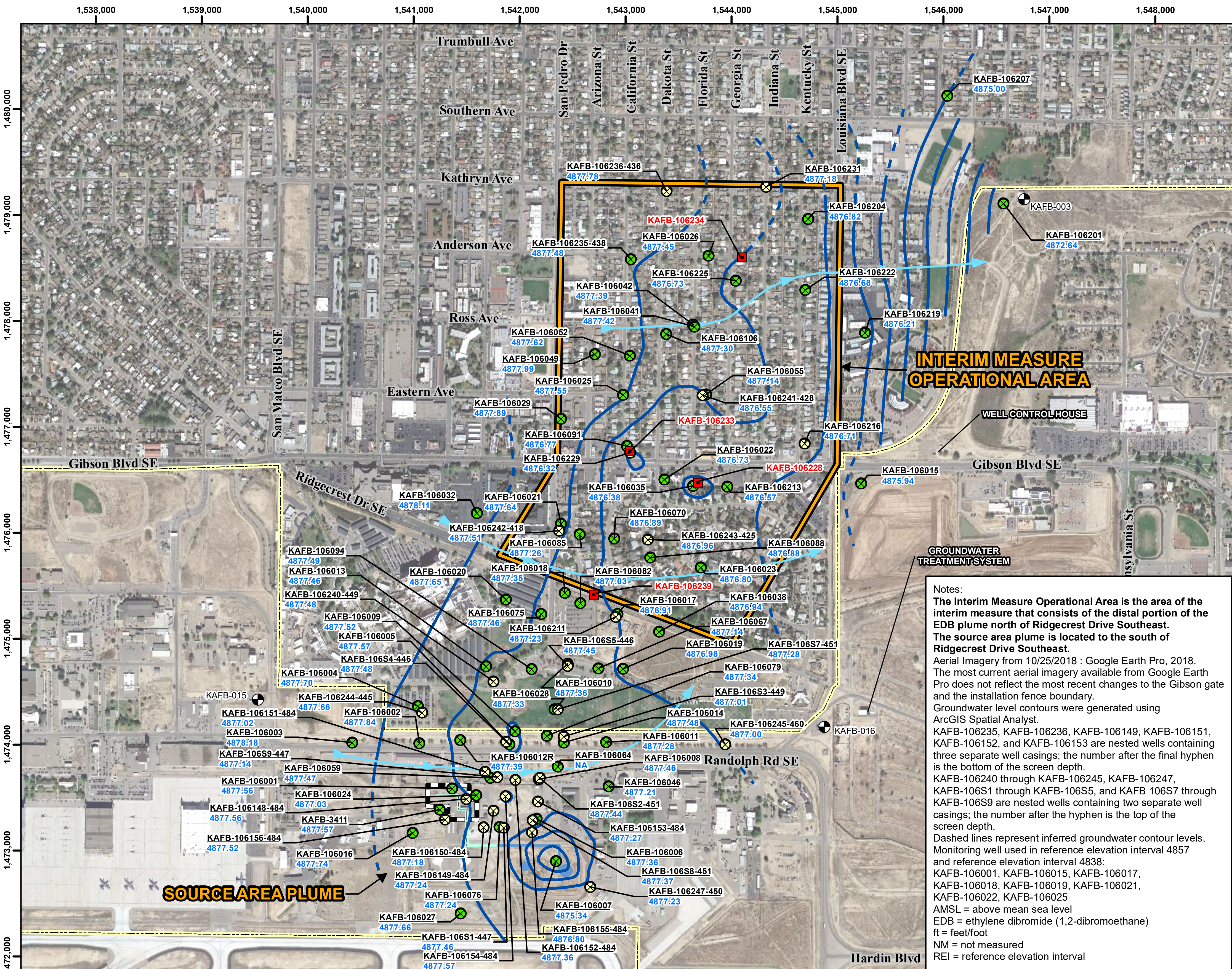
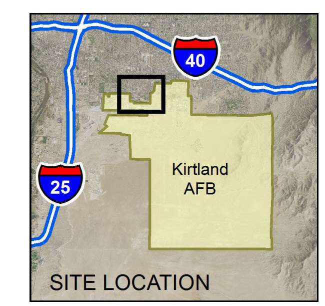


Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
Groundwater level contours were generated using ArcGIS Spatial Analyst.
KAFB-106235, KAFB-106236, KAFB-106149, KAFB-106151, KAFB-106152, and KAFB-106153 are nested wells containing three separate well casings; the number after the final hyphen is the bottom of the screen depth.
KAFB-106240 through KAFB-106245, KAFB-106247, KAFB-106S1 through KAFB-106S5, and KAFB 106S7 through KAFB-106S9 are nested wells containing two separate well casings; the number after the hyphen is the top of the screen depth.
Dashed lines represent inferred groundwater contour levels.
Monitoring well used in reference elevation interval 4857 and reference elevation interval 4838:
KAFB-106001, KAFB-106015, KAFB-106017,
KAFB-106018, KAFB-106019, KAFB-106021,
KAFB-106022, KAFB-106025
AMSL = above mean sea level
EDB = ethylene dibromide (1,2-dibromoethane)
ft = feet/foot
NM = not measured
REI = reference elevation interval

Legend

- REI 4857 Monitoring Well (screens not submerged)
- REI 4857 and REI 4857/4838 Groundwater Monitoring Wells with Fully Submerged Screens
- Drinking Water Supply Well
- Extraction Well
- Groundwater Level Contour (ft AMSL) (dashed where inferred)
- Groundwater Flow Direction
- Interim Measure Operational Area
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Source Area
- 4877.69 Groundwater Elevation (ft AMSL)



N
0 500 1,000 2,000
Feet
1 inch = 1,000 feet
Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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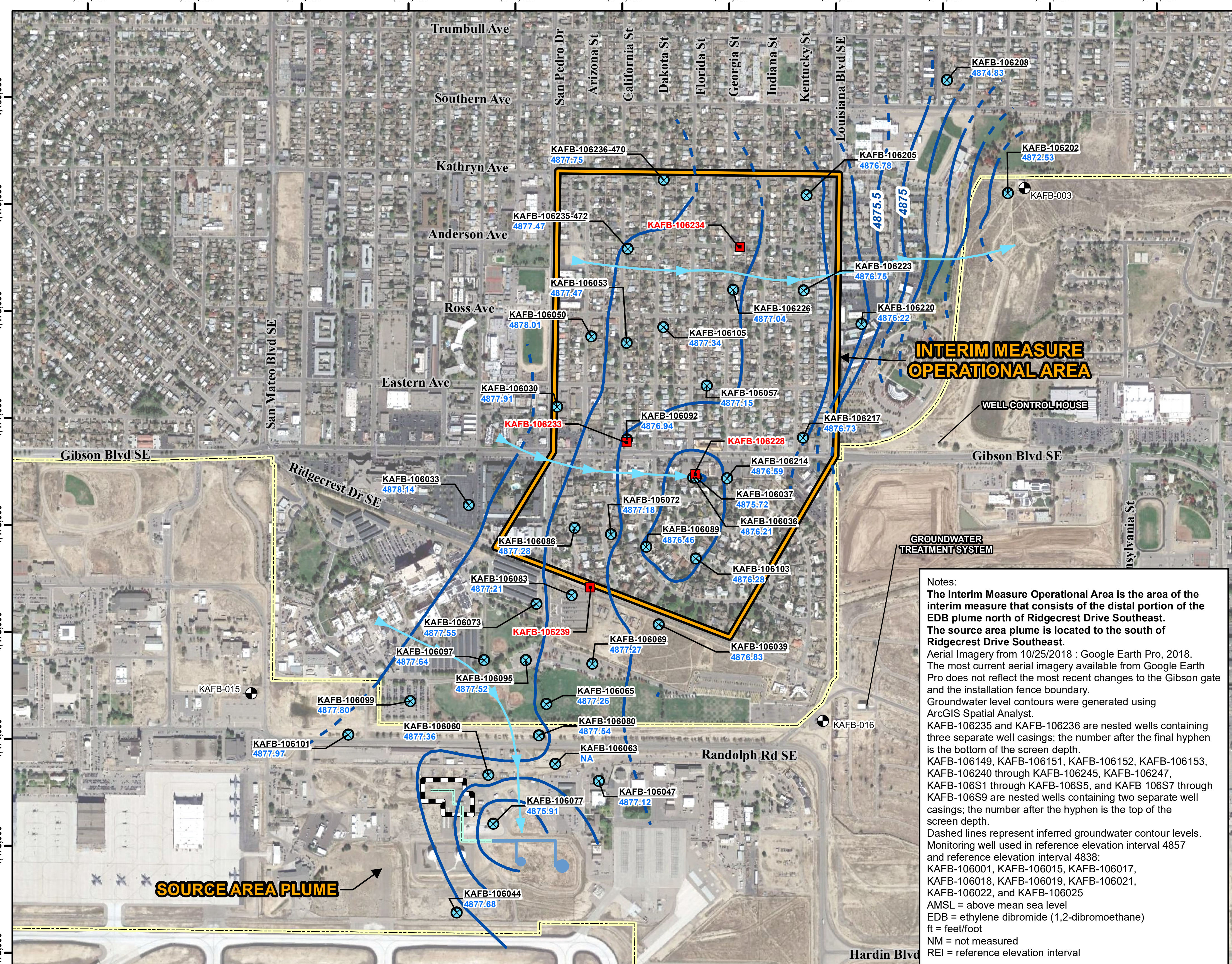
FIGURE 3-2

POTENTIOMETRIC SURFACE MAP OF REFERENCE ELEVATION INTERVAL 4857, JULY 20 - 24, 2020

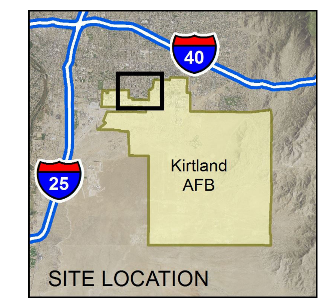
P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 3\3-2 Interval 4857 PotentiometricSurface_Q320.mxd 12/2/2020 EA ecarpio



Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
Groundwater level contours were generated using ArcGIS Spatial Analyst.
KAFB-106235 and KAFB-106236 are nested wells containing three separate well casings; the number after the final hyphen is the bottom of the screen depth.
KAFB-106149, KAFB-106151, KAFB-106152, KAFB-106153, KAFB-106240 through KAFB-106245, KAFB-106247, KAFB-106S1 through KAFB-106S5, and KAFB 106S7 through KAFB-106S9 are nested wells containing two separate well casings; the number after the hyphen is the top of the screen depth.
Dashed lines represent inferred groundwater contour levels.
Monitoring well used in reference elevation interval 4857 and reference elevation interval 4838:
KAFB-106001, KAFB-106015, KAFB-106017, KAFB-106018, KAFB-106019, KAFB-106021, KAFB-106022, and KAFB-106025
AMSL = above mean sea level
EDB = ethylene dibromide (1,2-dibromoethane)
ft = feet/foot
NM = not measured
REI = reference elevation interval

Legend

- REI 4838 Groundwater Monitoring Wells
- Drinking Water Supply Well
- Extraction Well
- Groundwater Level Contour (ft AMSL) (dashed where inferred)
- Groundwater Flow Direction
- Former Aboveground Storage
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer
- Installation Fence Boundary
- Interim Measure Operational Area
- Source Area
- 4877.43 Groundwater Elevation (ft AMSL)



N
0 500 1,000 2,000
Feet
1 inch = 1,000 feet
Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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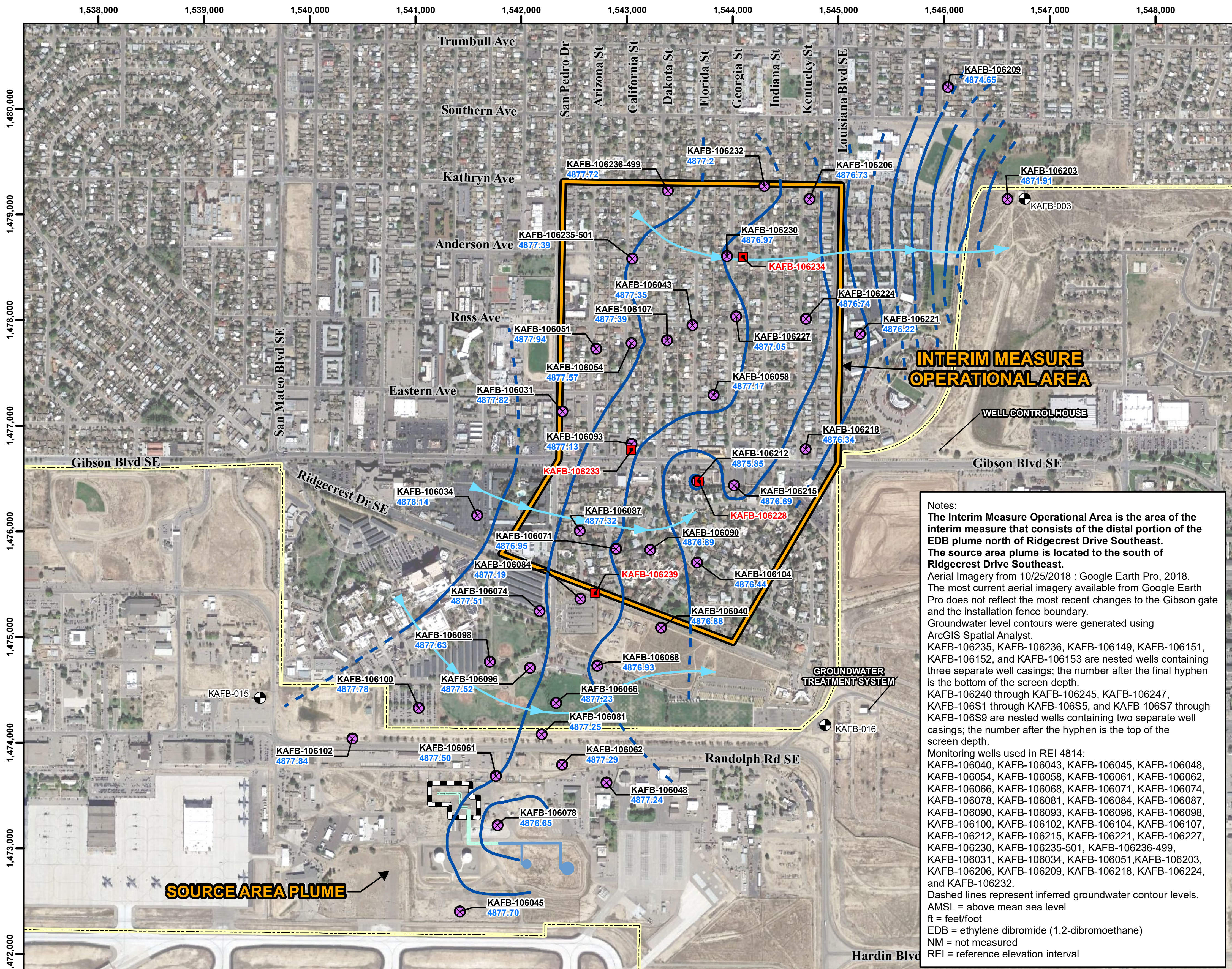
FIGURE 3-3

POTENTIOMETRIC SURFACE MAP OF REFERENCE ELEVATION INTERVAL 4838, JULY 20 - 24, 2020

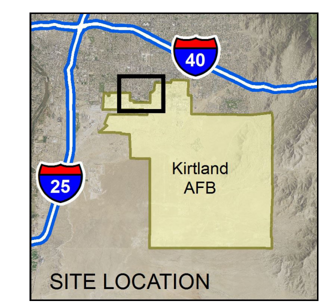
P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 3\3-3 Interval 4838 PotentiometricSurface_Q320.mxd 12/2/2020 EA ecarpio

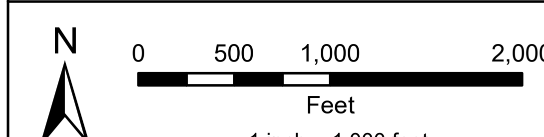


Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
Groundwater level contours were generated using ArcGIS Spatial Analyst.
KAFB-106235, KAFB-106236, KAFB-106149, KAFB-106151, KAFB-106152, and KAFB-106153 are nested wells containing three separate well casings; the number after the final hyphen is the bottom of the screen depth.
KAFB-106240 through KAFB-106245, KAFB-106247, KAFB-106S1 through KAFB-106S5, and KAFB 106S7 through KAFB-106S9 are nested wells containing two separate well casings; the number after the hyphen is the top of the screen depth.
Monitoring wells used in REI 4814:
KAFB-106040, KAFB-106043, KAFB-106045, KAFB-106048, KAFB-106054, KAFB-106058, KAFB-106061, KAFB-106062, KAFB-106066, KAFB-106068, KAFB-106071, KAFB-106074, KAFB-106078, KAFB-106081, KAFB-106084, KAFB-106087, KAFB-106090, KAFB-106093, KAFB-106096, KAFB-106098, KAFB-106100, KAFB-106102, KAFB-106104, KAFB-106107, KAFB-106212, KAFB-106215, KAFB-106221, KAFB-106227, KAFB-106230, KAFB-106235-501, KAFB-106236-499, KAFB-106031, KAFB-106034, KAFB-106051,KAFB-106203, KAFB-106206, KAFB-106209, KAFB-106218, KAFB-106224, and KAFB-106232.
Dashed lines represent inferred groundwater contour levels.
AMSL = above mean sea level
ft = feet/foot
EDB = ethylene dibromide (1,2-dibromoethane)
NM = not measured
REI = reference elevation interval

Legend

- REI 4814 Monitoring Wells with screens fully submerged
- Drinking Water Supply Well
- Extraction Well
- Groundwater Level Contour (ft AMSL) (dashed where inferred)
- Groundwater Flow Direction
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Interim Measure Operational Are
- Source Area
- 4877.43 Groundwater Elevation (ft AMSL)





1 inch = 1,000 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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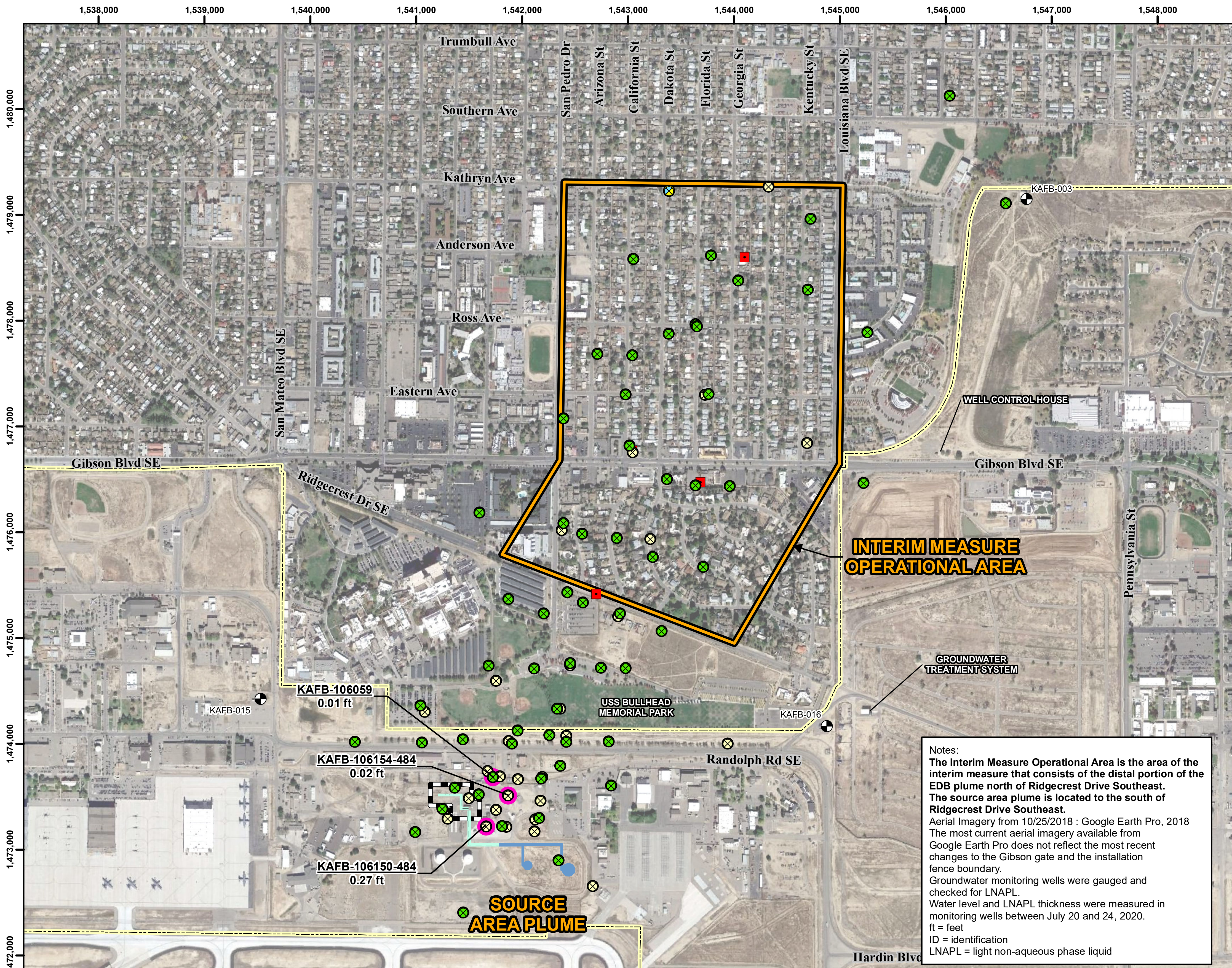
FIGURE 3-4

POTENTIOMETRIC SURFACE MAP OF REFERENCE ELEVATION INTERVAL 4814, JULY 20 - 24, 2020

P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 3\3-4 Interval 4814 PotentiometricSurface_Q320.mxd 12/2/2020 EA ecarpio

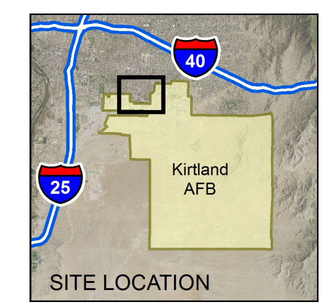


Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast. The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
Groundwater monitoring wells were gauged and checked for LNAPL.
Water level and LNAPL thickness were measured in monitoring wells between July 20 and 24, 2020.
ft = feet
ID = identification
LNAPL = light non-aqueous phase liquid

Legend

- Monitoring Well with Confirmed LNAPL
- Reference Elevation Interval 4857 Groundwater Monitoring Wells with top of screen unsubmerged
- Reference Elevation Interval 4857 and 4857/4838 Groundwater Monitoring Wells with fully submerged screens
- Nested Groundwater Monitoring Well
- Extraction Well
- Drinking Water Supply Well
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Interim Measure Operational Area
- Source Area

Well Location ID
LNAPL Thickness (ft)



N
0 500 1,000 2,000
Feet
1 inch = 1,000 feet
Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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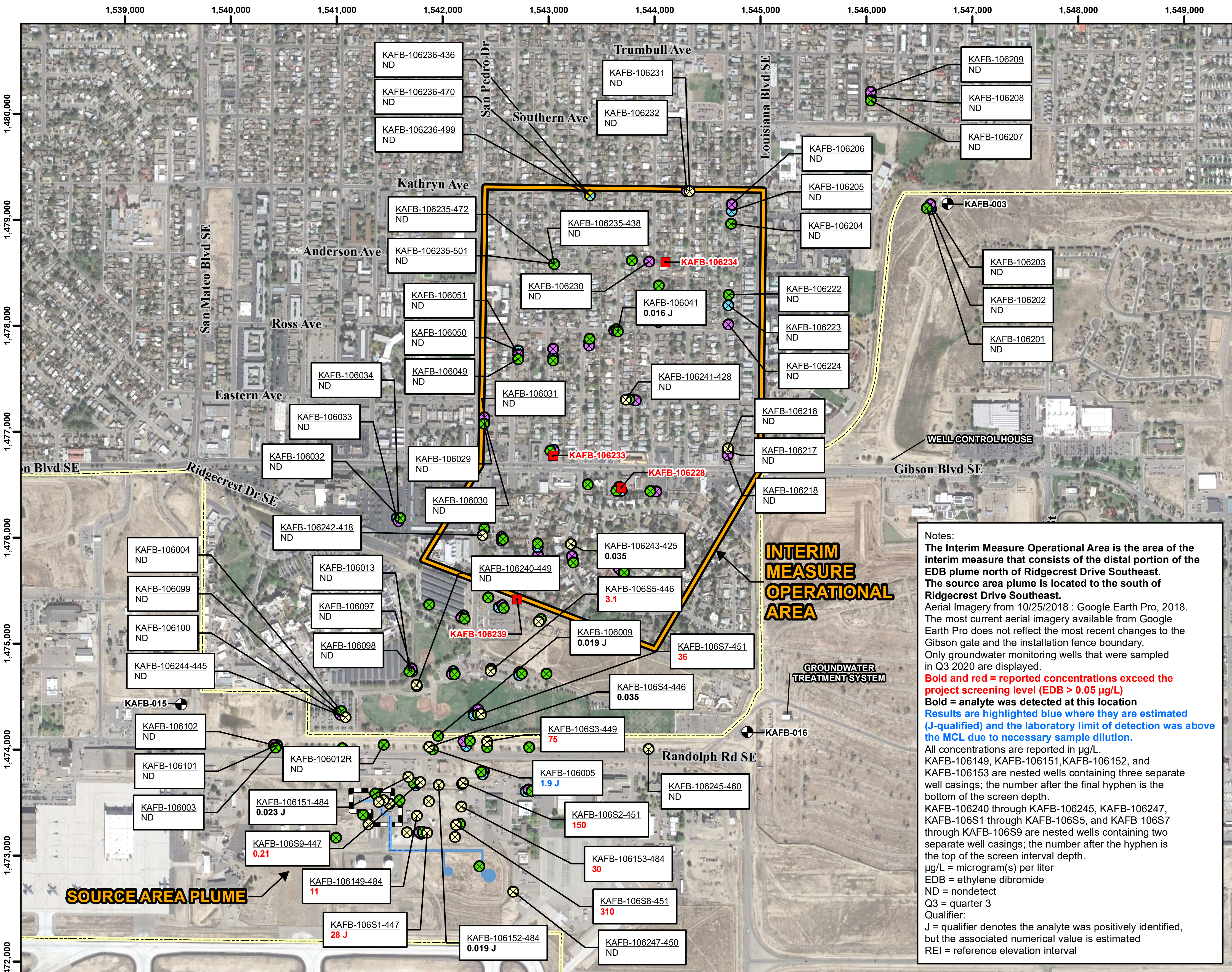
FIGURE 3-5

GROUNDWATER MONITORING WELLS WITH MEASURABLE LNAPL
JULY 20 - 24, 2020

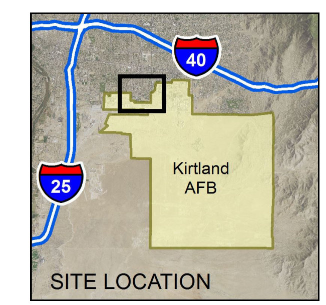
P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 3\3-5 GWM with Measurable LNAPL_Q320.mxd 10/22/2020 EA ecarpio



P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 3\3-6 EDB_Q320.mxd 11/9/2020 EA ecarpio

Legend

- REI 4857 Groundwater Monitoring Wells with top of screen unsubmerged
- REI 4857 and REI 4857/4838 Groundwater Monitoring Wells with fully submerged screens
- REI 4838 Groundwater Monitoring Wells
- REI 4814 Groundwater Monitoring Wells
- Nested Groundwater Monitoring Well
- Extraction Well
- Drinking Water Supply Well
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Interim Measure Operational Area
- Bulk Fuels Facility (SWMU ST-106/SS-111)



N

0 500 1,000 2,000

Feet

1 inch = 1,000 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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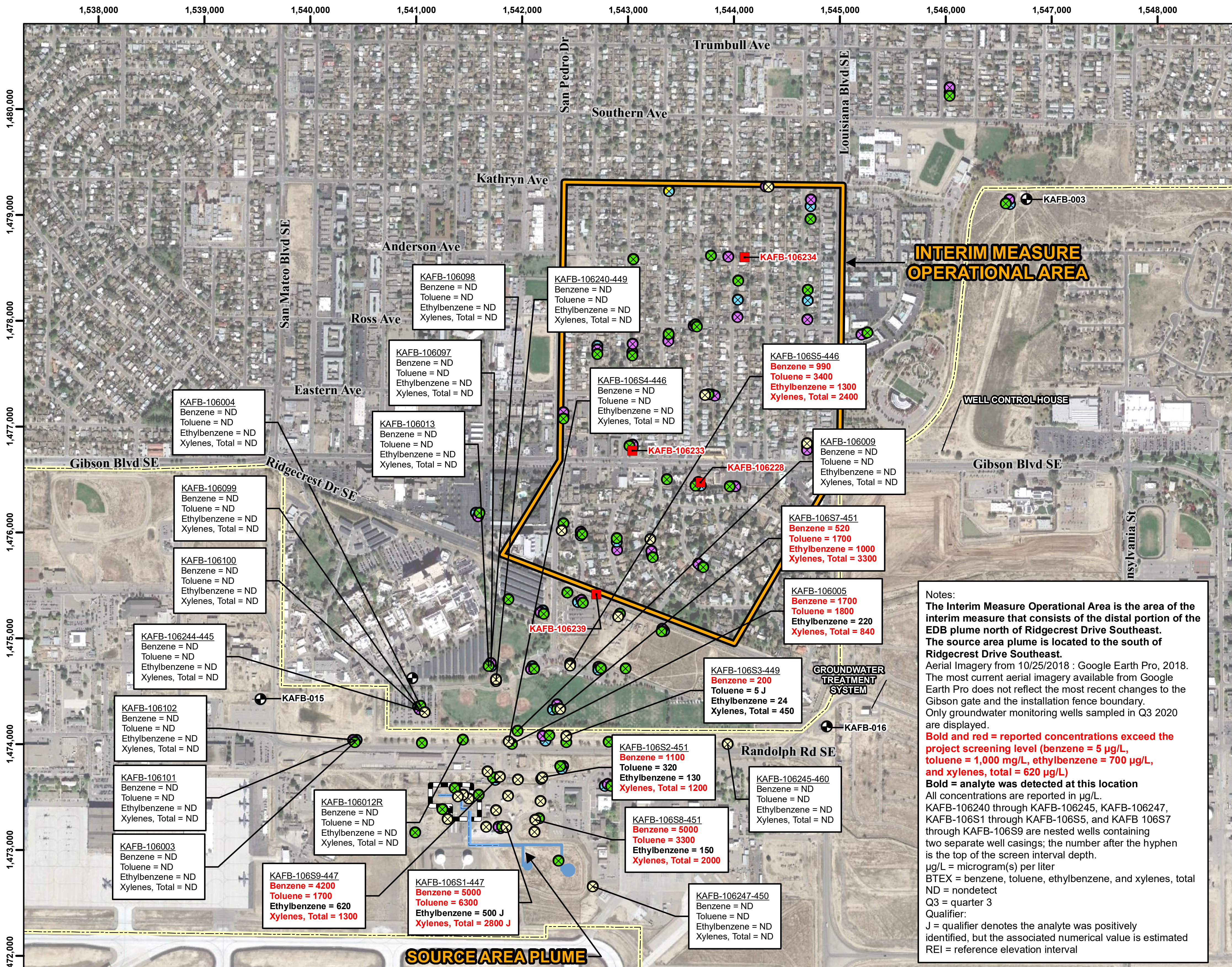
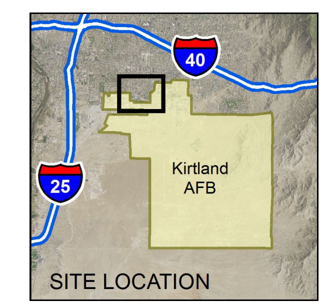
FIGURE 3-6

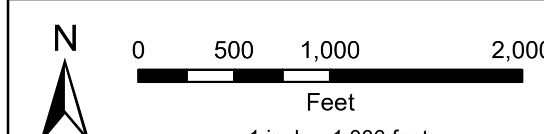
EDB CONCENTRATIONS, Q3 2020



Legend

- REI 4857 Groundwater Monitoring Wells with top of screen unsubmerged
- REI 4857 and REI 4857/4838 Groundwater Monitoring Wells with fully submerged screens
- REI 4838 Groundwater Monitoring Wells
- REI 4814 Groundwater Monitoring Wells
- Nested Groundwater Monitoring Well
- Drinking Water Supply Well
- Extraction Well
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Interim Measure Operational Area
- Source Area





1 inch = 1,000 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

Notes:

The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.

The source area plume is located to the south of Ridgecrest Drive Southeast.

Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018. The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.

Only groundwater monitoring wells sampled in Q3 2020 are displayed.

Bold and red = reported concentrations exceed the project screening level (benzene = 5 µg/L, toluene = 1,000 mg/L, ethylbenzene = 700 µg/L, and xylenes, total = 620 µg/L)

Bold = analyte was detected at this location

All concentrations are reported in µg/L.

KAFB-106240 through KAFB-106245, KAFB-106247, KAFB-106S1 through KAFB-106S5, and KAFB 106S7 through KAFB-106S9 are nested wells containing two separate well casings; the number after the hyphen is the top of the screen interval depth.

µg/L = microgram(s) per liter

BTEX = benzene, toluene, ethylbenzene, and xylenes, total

ND = nondetect

Q3 = quarter 3

Qualifier:

J = qualifier denotes the analyte was positively identified, but the associated numerical value is estimated

REI = reference elevation interval

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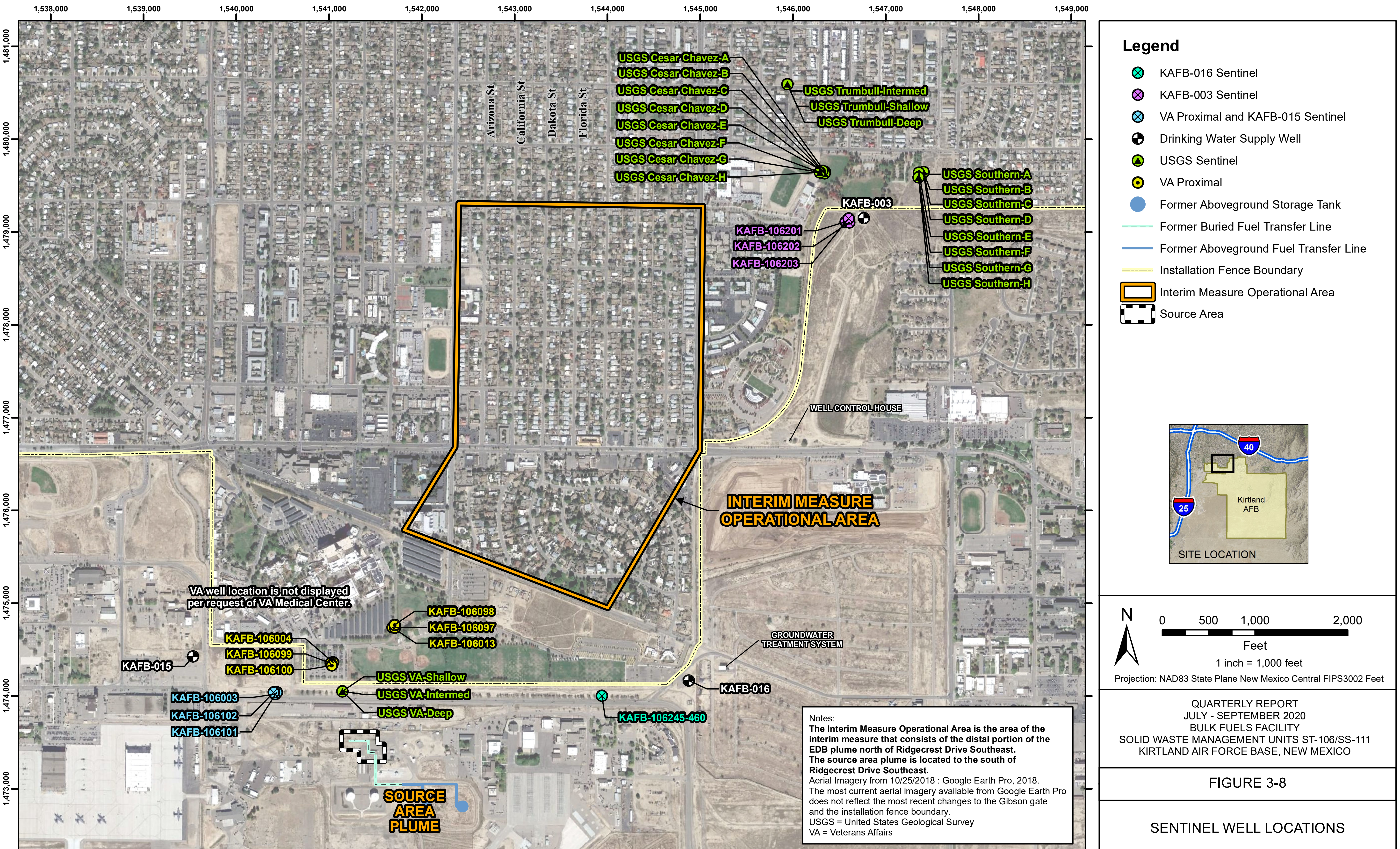
FIGURE 3-7

BTEX CONCENTRATIONS, Q3 2020



Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
USGS = United States Geological Survey
VA = Veterans Affairs

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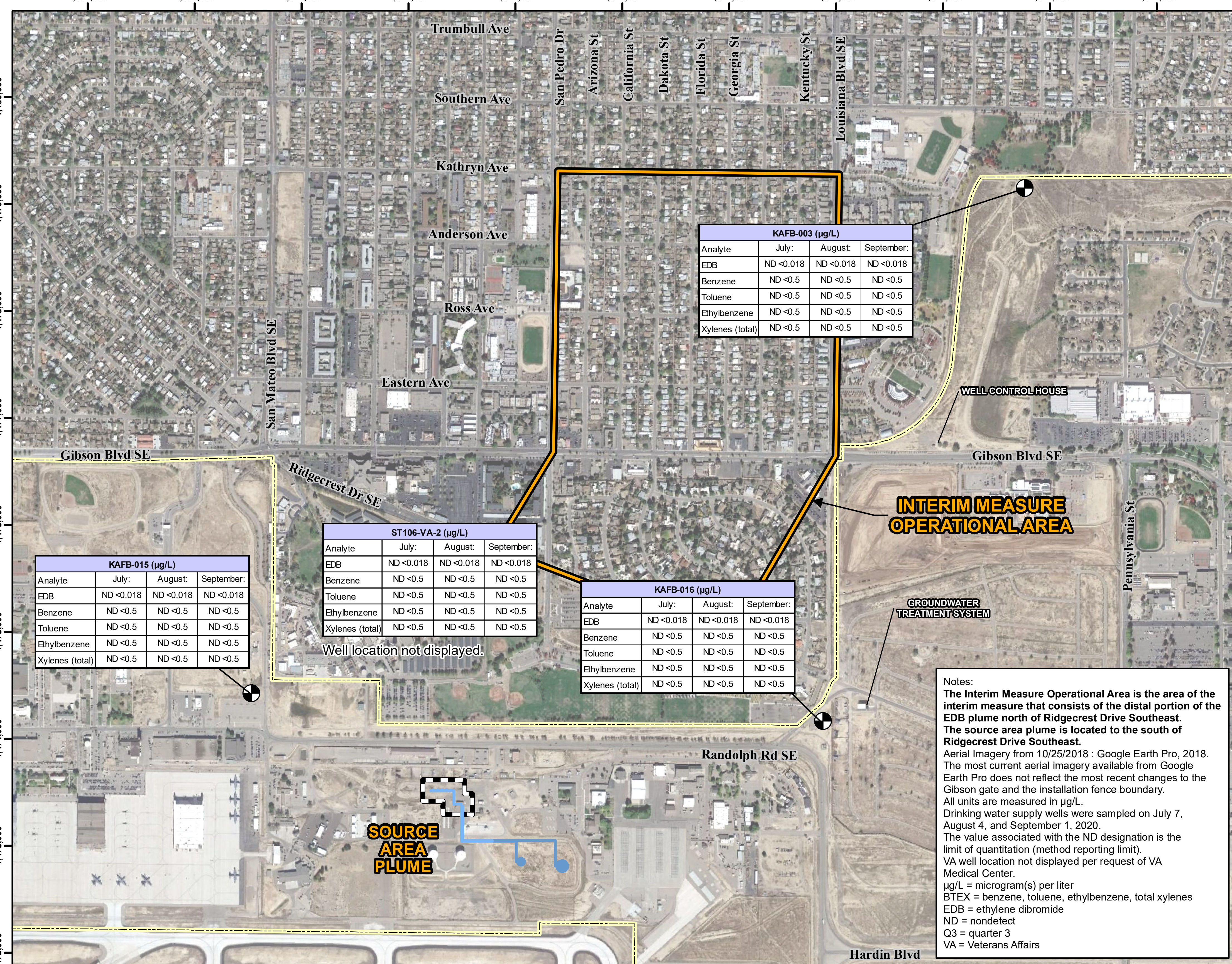
FIGURE 3-8

SENTINEL WELL LOCATIONS

P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 3\3-8_SENTINEL_WELL_LOCATION_MAP_Q320.mxd 10/22/2020 EA ecarpio



KAFB-003 (µg/L)			
Analyte	July:	August:	September:
EDB	ND <0.018	ND <0.018	ND <0.018
Benzene	ND <0.5	ND <0.5	ND <0.5
Toluene	ND <0.5	ND <0.5	ND <0.5
Ethylbenzene	ND <0.5	ND <0.5	ND <0.5
Xylenes (total)	ND <0.5	ND <0.5	ND <0.5

ST106-VA-2 (µg/L)			
Analyte	July:	August:	September:
EDB	ND <0.018	ND <0.018	ND <0.018
Benzene	ND <0.5	ND <0.5	ND <0.5
Toluene	ND <0.5	ND <0.5	ND <0.5
Ethylbenzene	ND <0.5	ND <0.5	ND <0.5
Xylenes (total)	ND <0.5	ND <0.5	ND <0.5

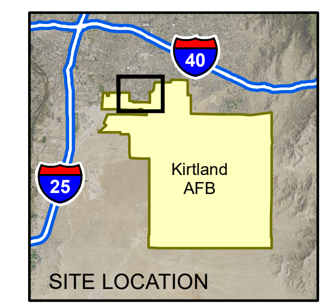
KAFB-015 (µg/L)			
Analyte	July:	August:	September:
EDB	ND <0.018	ND <0.018	ND <0.018
Benzene	ND <0.5	ND <0.5	ND <0.5
Toluene	ND <0.5	ND <0.5	ND <0.5
Ethylbenzene	ND <0.5	ND <0.5	ND <0.5
Xylenes (total)	ND <0.5	ND <0.5	ND <0.5

KAFB-016 (µg/L)			
Analyte	July:	August:	September:
EDB	ND <0.018	ND <0.018	ND <0.018
Benzene	ND <0.5	ND <0.5	ND <0.5
Toluene	ND <0.5	ND <0.5	ND <0.5
Ethylbenzene	ND <0.5	ND <0.5	ND <0.5
Xylenes (total)	ND <0.5	ND <0.5	ND <0.5

Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
All units are measured in µg/L.
Drinking water supply wells were sampled on July 7, August 4, and September 1, 2020.
The value associated with the ND designation is the limit of quantitation (method reporting limit).
VA well location not displayed per request of VA Medical Center.
µg/L = microgram(s) per liter
BTEX = benzene, toluene, ethylbenzene, total xylenes
EDB = ethylene dibromide
ND = nondetect
Q3 = quarter 3
VA = Veterans Affairs

Legend

- Drinking Water Supply Wells
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Installation Fence Boundary
- Former Aboveground Storage Tank
- Interim Measure Operational Area
- Source Area



N
0 500 1,000 2,000
Feet
1 inch = 1,000 feet
Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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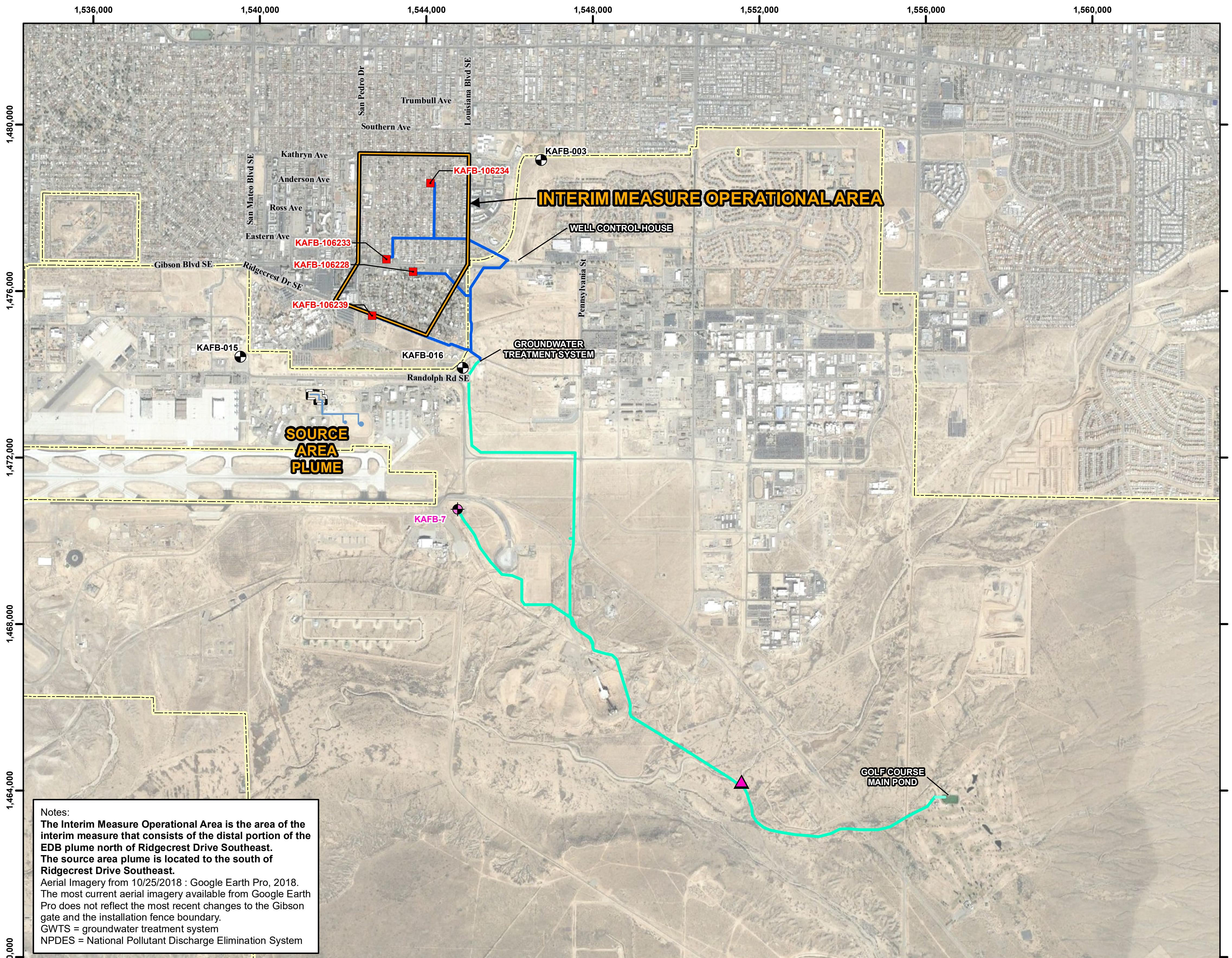
FIGURE 4-1

EDB AND BTEX RESULTS IN DRINKING WATER SUPPLY WELLS, Q3 2020

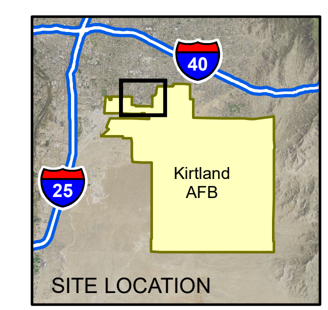
P:\Projects\Kirtland\Figures\Drinking Water Supply Wells\Quarterly Reports 2020\4-1 EDB BTEX Drinking Water Supply Q320.mxd 10/22/2020 EA ecarpio



Notes:
The Interim Measure Operational Area is the area of the interim measure that consists of the distal portion of the EDB plume north of Ridgecrest Drive Southeast.
The source area plume is located to the south of Ridgecrest Drive Southeast.
Aerial Imagery from 10/25/2018 : Google Earth Pro, 2018.
The most current aerial imagery available from Google Earth Pro does not reflect the most recent changes to the Gibson gate and the installation fence boundary.
GWTS = groundwater treatment system
NPDES = National Pollutant Discharge Elimination System

Legend

- Injection Well
- Extraction Well
- Drinking Water Supply Well
- NPDES Outfall Location
- Former Aboveground Storage Tank
- Former Fuel Transfer Line
- GWTS Influent Piping
- GWTS Effluent Piping
- Installation Fence Boundary
- Interim Measure Operational Area
- Source Area



N
0 1,250 2,500 5,000
Feet
1 inch = 2,500 feet
Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

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FIGURE 5-1

GROUNDWATER EXTRACTION AND TREATMENT SYSTEM LOCATION

P:\Projects\Kirtland\Figures\BFF Quarterly Report\2020_Q3\Section 5\5-1 Groundwater Extraction and Treatment System_Q320.mxd 10/22/2020 EA ecarpio

TABLES

Table 3-1
Groundwater Monitoring Program

Well Location ID	1st Quarter (January-March)	2nd Quarter Semiannual (April-June)	3rd Quarter (July-September)	4th Quarter Annual (October-December)	Former Well Designation and Current Monitoring Well Objective[a]
Newly Added Wells[b]					
KAFB-106S7-451[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
Groundwater Monitoring Wells[b]					
KAFB-106001[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106002	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106003	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal, KAFB-015 Sentinel
KAFB-106004	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal
KAFB-106005[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106006	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106007	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106008[c]	None	BTEX, EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106009[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106010	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106011	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106012R	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, metals, anions, alkalinity, FP	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106013	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal
KAFB-106014	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106015[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106016	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106017	None	BTEX, Naphthalene, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Signal
KAFB-106018	None	BTEX, Naphthalene, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Signal
KAFB-106019	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106020	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106021[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106022[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106023[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106024	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106025[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106026[c,d]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106027	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106028[c]	None	BTEX, EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106029[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106030[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106031[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106032[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106033[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106034[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106035[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring; Groundwater well paired with KAFB-106228 extraction well
KAFB-106036[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring; Groundwater well paired with KAFB-106228 extraction well

Table 3-1
Groundwater Monitoring Program

Well Location ID	1st Quarter (January-March)	2nd Quarter Semiannual (April-June)	3rd Quarter (July-September)	4th Quarter Annual (October-December)	Former Well Designation and Current Monitoring Well Objective[a]
KAFB-106037[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring; Groundwater well paired with KAFB-106228 extraction well
KAFB-106038	None	BTEX, Naphthalene, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Signal
KAFB-106039	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106040	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106041[c]	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106042[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106043[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106044	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106045	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106046	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106047	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106048	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106049[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106050[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106051[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106052[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106053[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106054[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106055[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106057[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106058[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106059	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106060	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106061	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106062	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106063	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106064	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106065	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106066	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106067	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106068	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106069	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106070[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106071[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106072[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106073	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106074	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106075	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106076	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106077	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106078	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106079[c]	None	BTEX, EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106080	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106081	None	BTEX, EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Source Area
KAFB-106082	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106083	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring

Table 3-1
Groundwater Monitoring Program

Well Location ID	1st Quarter (January-March)	2nd Quarter Semiannual (April-June)	3rd Quarter (July-September)	4th Quarter Annual (October-December)	Former Well Designation and Current Monitoring Well Objective[a]
KAFB-106084	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106085[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106086[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106087[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106088[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106089[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106090[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106091[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106092[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106093[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106094	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106095	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106096	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring
KAFB-106097	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal
KAFB-106098	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal
KAFB-106099	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal
KAFB-106100	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal
KAFB-106101	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal, KAFB-015 Sentinel
KAFB-106102	BTEX, EDB, FP	BTEX, EDB, metals, anions, alkalinity, FP	BTEX, EDB, FP	EDB, VOCs, metals, anions, alkalinity, FP	VA Proximal, KAFB-015 Sentinel
KAFB-106103[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106104[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106105[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106106[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106107[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106149-484[c]	EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106151-484[c]	EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106152-484[c]	EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106153-484[c]	EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106201[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	KAFB-003 Sentinel
KAFB-106202[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	KAFB-003 Sentinel
KAFB-106203[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	KAFB-003 Sentinel
KAFB-106204[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106205[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106206[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106207[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106208[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106209[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106211[e]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106212[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106213[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106214[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106215[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106216[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106217[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106218[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106219[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106220[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106221[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106222[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)

Table 3-1
Groundwater Monitoring Program

Well Location ID	1st Quarter (January-March)	2nd Quarter Semiannual (April-June)	3rd Quarter (July-September)	4th Quarter Annual (October-December)	Former Well Designation and Current Monitoring Well Objective[a]
KAFB-106223[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106224[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106225[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106226[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106227[c]	None	EDB, metals, anions, alkalinity	None	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106229[c,f]	None	EDB	None	EDB	Groundwater well paired with KAFB-106233 extraction well
KAFB-106230[c,d]	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106231[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106232[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106235-438[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106235-472[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106235-501[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106236-436[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106236-470[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106236-499[c]	EDB	EDB, metals, anions, alkalinity	EDB	EDB, VOCs, metals, anions, alkalinity	Former Downgradient Proximal; Current Upgradient Well
KAFB-106240-449[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	VA Proximal
KAFB-106241-428[c]	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106242-418[c]	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106243-425[c]	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Groundwater Monitoring
KAFB-106244-445[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	VA Proximal
KAFB-106245-460[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	KAFB-016 Sentinel
KAFB-106247-450[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Downgradient Proximal (Seasonal)
KAFB-106S1-447[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106S2-451[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106S3-449[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106S4-446[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106S5-446[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106S8-451[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-106S9-447[c]	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	BTEX, EDB, metals, anions, alkalinity	EDB, VOCs, metals, anions, alkalinity	Source Area
KAFB-3411	None	EDB, metals, anions, alkalinity, FP	None	EDB, VOCs, metals, anions, alkalinity, FP	Groundwater Monitoring

Table 3-1
Groundwater Monitoring Program

[a] Monitoring Well Objective:

Downgradient Proximal (Seasonal) Wells—Primarily located north of Ridgecrest Drive SE surrounding the historical EDB plume to the north and east into the distal portion of the GWM network. One well located to the south and east of the Benzene plume. Groundwater flow direction varies seasonally; these wells are downgradient of the EDB plume during part of each year. Analytical data for these wells have been historically below the maximum contaminant level (MCL) for EDB. Sampled every quarter. These wells assist in plume boundary definition.

Former Downgradient Proximal; Current Upgradient Wells—Primarily located north of Ridgecrest Drive SE to the west and north of the historical EDB plume. These wells were previously downgradient of the historical EDB plume, but as groundwater flow direction has shifted, they are currently upgradient. Sampled every quarter.

Groundwater Monitoring Wells—Primarily located north of Ridgecrest Drive SE within the historical footprint of the EDB plume. Analytical data from these wells help to estimate the volume and mass of the EDB plume throughout the GWM network. Sampled in Q2 and Q4 at a minimum, with wells previously designated as newly added sampled every quarter.

KAFB-003 Sentinel Wells—One set of nested wells located west of drinking water production well KAFB-003. Sampled every quarter. These wells help to assess any potential contaminant migration towards KAFB-003.

KAFB-015 Sentinel Wells—One set of nested wells located east of drinking water production well KAFB-015. Sampled every quarter. These wells help to assess any potential contaminant migration towards KAFB-015.

KAFB-016 Sentinel Well—One well located west of drinking water production well KAFB-016. Sampled every quarter. This well helps to assess the potential for contaminant migration towards KAFB-016.

Paired wells—Wells located near a GWM IM extraction well to assess the quality of the water entering the extraction well.

Signal Wells—Three wells located along the south side of Ridgecrest Drive SE to monitor BTEX and provide early indication if the benzene plume is migrating from the source area into the interim measure target area capture zone created by the groundwater extraction wells. Sampled during Q2 and Q4.

Source Area Wells—Primarily located in the Bulk Fuels Facility south of Randolph Road SE and proximal to the spill site on-Base. Sampled during Q2 and Q4 at a minimum, with some sampled every quarter. These wells monitor the higher concentrations of dissolved-phase plumes on-Base.

VA Proximal Wells—Three sets of nested wells located between the historical EDB plume south of Ridgecrest Drive SE and the Raymond G. Murphy VA Medical Center as a means to observe for potential contaminant migration towards the VA medical campus. Sampled every quarter. These wells provide additional wellhead protection monitoring for the VA supply well.

[b] The groundwater monitoring network includes 161 wells that are currently sampled and one well which will be sampled once water level has risen sufficiently. Select wells are identified for additional or more frequent monitoring of risk-driving constituents. Metals analysis consists of select total metals (arsenic, calcium, lead, potassium, magnesium, and sodium) and select dissolved metals (iron and manganese). Anions analysis consists of bromide, chloride, nitrate/nitrite nitrogen, and sulfate. Field parameters include pH, specific conductivity, dissolved oxygen, oxidation reduction potential, temperature, and turbidity.

Newly Added Wells—Newly added wells can include both existing wells that are added to the GWM network as well as newly installed wells. Newly added GWM wells require a minimum of four quarters of baseline full-suite analytical sampling. These wells have been added to assess the plume boundaries and provide additional water table monitoring due to the rising groundwater elevation.

Groundwater Monitoring Wells—Wells which have completed the minimum four quarters of baseline full-suite analytical sampling. These wells can have any of the objectives described above.

[c] Well sampled with passive sampling methodology; field parameter measurements are not representative and therefore are not collected.

[d] Well was removed from the groundwater monitoring network due to safety concerns after Q2 2016. These concerns were mitigated and sampling resumed in Q4 2019; sampling at this well is considered supplemental to the groundwater monitoring program.

[e] KAFB-106211 will be included for sampling when it has enough saturated water column to deploy passive samplers (former air sparge well).

[f] KAFB-106229 is not formally part of the groundwater monitoring network. However, it gets sampled semiannually for EDB.

BTEX = benzene, toluene, ethylbenzene, and total xylenes

EDB = ethylene dibromide

FP = field parameter

GWM = groundwater monitoring

ID = identification

IM = interim measure

Q2 = second quarter

Q4 = fourth quarter

SE = Southeast

SWMU = Solid Waste Management Unit

VA = Veterans Affairs

VOC = volatile organic compound

Table 3-2
Groundwater Elevation and Light Non-Aqueous Phase Liquid Thickness, Q3 2020

Well Location ID	Reference Elevation Interval (ft AMSL)	Measurement Date and Time	MRP Elevation (ft AMSL)	Well Depth[a] (ft MRP)	Screened Interval (ft AMSL)	Depth to LNAPL[b] (ft MRP)	Depth to Water[b] (ft MRP)	Screen Submergence Depth[c] (ft)	Measured LNAPL Thickness (ft)	LNAPL Elevation (ft AMSL)	Groundwater Elevation Corrected for LNAPL Thickness[d] (ft AMSL)
KAFB-106001[e]	4857/4838	7/23/20 11:00	5344.90	512.89	4859-4834	—	467.34	18.56	—	—	4877.56
KAFB-106002[f]	4857	7/23/20 11:00	5342.24	506.39	4861-4836	—	464.40	16.84	—	—	4877.84
KAFB-106003	4857	7/23/20 10:50	5340.28	506.99	4861-4836	—	462.10	17.18	—	—	4878.18
KAFB-106004	4857	7/23/20 7:40	5345.81	512.81	4859-4834	—	468.11	18.70	—	—	4877.70
KAFB-106005	4857	7/23/20 6:40	5346.91	509.38	4865-4840	—	469.34	12.57	—	—	4877.57
KAFB-106006	4857	7/23/20 9:50	5351.48	514.72	4865-4840	—	474.12	12.36	—	—	4877.36
KAFB-106007	4857	7/24/20 10:00	5349.60	516.28	4861-4836	—	474.26	14.34	—	—	4875.34
KAFB-106008	4857	7/23/20 12:15	5351.77	513.26	4863-4838	—	474.31	14.45	—	—	4877.46
KAFB-106009	4857	7/23/20 6:40	5348.55	510.11	4865-4840	—	471.03	12.52	—	—	4877.52
KAFB-106010	4857	7/23/20 7:45	5343.26	510.28	4860-4835	—	465.90	17.36	—	—	4877.36
KAFB-106011[f]	4857	7/23/20 11:20	5353.15	519.05	4864-4839	—	475.87	13.28	—	—	4877.28
KAFB-106012R	4857	7/23/20 11:10	5345.00	502.84	4877-4847	—	467.61	0.39	—	—	4877.39
KAFB-106013	4857	7/22/20 7:45	5350.62	519.40	4861-4836	—	473.16	16.46	—	—	4877.46
KAFB-106014	4857	7/23/20 13:40	5350.22	519.58	4861-4836	—	472.74	16.48	—	—	4877.48
KAFB-106015[e]	4857/4838	7/24/20 8:20	5342.44	518.55	4855-4830	—	466.50	20.94	—	—	4875.94
KAFB-106016[f]	4857	7/24/20 9:20	5342.43	508.29	4864-4839	—	464.69	13.74	—	—	4877.74
KAFB-106017[e,f]	4857/4838	7/23/20 8:05	5342.52	515.61	4857-4832	—	465.61	19.91	—	—	4876.91
KAFB-106018[e,f]	4857/4838	7/22/20 8:45	5336.31	508.96	4857-4832	—	458.96	20.35	—	—	4877.35
KAFB-106019[e]	4857/4838	7/23/20 8:15	5354.62	525.80	4859-4834	—	477.64	17.97	—	—	4876.98
KAFB-106020	4857	7/22/20 7:00	5341.05	510.63	4859-4834	—	463.40	18.65	—	—	4877.65
KAFB-106021[e]	4857/4838	7/20/20 11:50	5314.33	487.00	4856-4831	—	436.69	21.64	—	—	4877.64
KAFB-106022[e]	4857/4838	7/22/20 14:30	5318.06	491.85	4856-4831	—	441.33	20.73	—	—	4876.73
KAFB-106023	4857	7/24/20 7:40	5328.76	503.07	4856-4831	—	451.96	20.80	—	—	4876.80
KAFB-106024[f]	4857	7/24/20 10:35	5343.55	511.00	4863-4838	—	466.52	14.03	—	—	4877.03
KAFB-106025[e]	4857/4838	7/21/20 13:00	5317.28	494.58	4852-4827	—	439.73	25.55	—	—	4877.55
KAFB-106026	4857	7/21/20 12:30	5322.68	491.33	4857-4837	—	445.23	20.45	—	—	4877.45
KAFB-106027[f]	4857	7/20/20 7:00	5348.62	509.16	4864-4844	—	470.96	13.66	—	—	4877.66
KAFB-106028	4857	7/23/20 7:45	5348.89	516.85	4863-4838	—	471.56	14.33	—	—	4877.33
KAFB-106029	4857	7/20/20 10:30	5310.94	476.73	4860-4840	—	433.05	17.89	—	—	4877.89
KAFB-106030	4838	7/20/20 10:30	5311.03	490.23	4842-4827	—	433.12	--	—	—	4877.91
KAFB-106031	4814	7/20/20 10:30	5311.06	515.59	4815-4802	—	433.24	--	—	—	4877.82
KAFB-106032	4857	7/21/20 7:00	5317.60	480.52	4862-4842	—	439.49	16.11	—	—	4878.11
KAFB-106033	4838	7/21/20 7:00	5317.76	497.12	4841-4826	—	439.62	--	—	—	4878.14
KAFB-106034	4814	7/21/20 7:00	5318.63	523.31	4817-4802	—	440.49	--	—	—	4878.14
KAFB-106035	4857	7/22/20 14:00	5321.58	486.86	4869-4839	—	445.20	7.38	—	—	4876.38
KAFB-106036	4838	7/22/20 14:00	5321.85	501.39	4840-4825	—	445.64	--	—	—	4876.21
KAFB-106037	4838	7/22/20 14:00	5322.10	527.06	4815-4800	—	446.38	--	—	—	4875.72
KAFB-106038	4857	7/23/20 9:15	5351.61	515.31	4870-4840	—	474.67	6.94	—	—	4876.94
KAFB-106039	4838	7/23/20 9:15	5351.32	530.29	4840-4825	—	474.49	--	—	—	4876.83
KAFB-106040	4814	7/23/20 9:15	5350.26	552.45	4817-4802	—	473.38	--	—	—	4876.88
KAFB-106041	4857	7/21/20 11:15	5324.35	473.42	4875-4855	—	446.93	2.42	—	—	4877.42
KAFB-106042	4857	7/21/20 11:15	5324.07	488.42	4855-4841	—	446.68	22.39	—	—	4877.39
KAFB-106043	4814	7/21/20 11:15	5324.30	562.05	4781-4767	—	446.95	--	—	—	4877.35
KAFB-106044[f]	4838	7/20/20 7:00	5348.79	524.09	4841-4826	—	471.11	--	—	—	4877.68
KAFB-106045	4814	7/20/20 7:00	5348.52	551.00	4817-4802	—	470.82	--	—	—	4877.70
KAFB-106046[f]	4857	7/24/20 9:00	5352.84	515.04	4863-4843	—	475.63	14.21	—	—	4877.21
KAFB-106047[f]	4838	7/24/20 9:00	5352.81	532.01	4841-4826	—	475.69	--	—	—	4877.12
KAFB-106048	4814	7/24/20 9:00	5352.58	556.23	4817-4802	—	475.34	--	—	—	4877.24
KAFB-106049	4857	7/21/20 8:45	5316.10	479.91	4859-4839	—	438.11	18.99	—	—	4877.99
KAFB-106050	4838	7/21/20 8:45	5315.51	494.13	4841-4826	—	437.50	--	—	—	4878.01

Table 3-2
Groundwater Elevation and Light Non-Aqueous Phase Liquid Thickness, Q3 2020

Well Location ID	Reference Elevation Interval (ft AMSL)	Measurement Date and Time	MRP Elevation (ft AMSL)	Well Depth[a] (ft MRP)	Screened Interval (ft AMSL)	Depth to LNAPL[b] (ft MRP)	Depth to Water[b] (ft MRP)	Screen Submergence Depth[c] (ft)	Measured LNAPL Thickness (ft)	LNAPL Elevation (ft AMSL)	Groundwater Elevation Corrected for LNAPL Thickness[d] (ft AMSL)
KAFB-106051	4814	7/21/20 8:45	5315.78	520.44	4815-4800	—	437.84	--	—	—	4877.94
KAFB-106052	4857	7/21/20 9:40	5318.86	484.00	4869-4839	—	441.24	8.62	—	—	4877.62
KAFB-106053	4838	7/21/20 9:40	5318.67	498.04	4840-4825	—	441.20	--	—	—	4877.47
KAFB-106054	4814	7/21/20 9:40	5318.38	523.22	4814-4799	—	440.81	--	—	—	4877.57
KAFB-106055	4857	7/21/20 13:30	5325.09	490.26	4859-4839	—	447.95	18.14	—	—	4877.14
KAFB-106057	4838	7/21/20 13:30	5325.46	505.37	4841-4826	—	448.31	--	—	—	4877.15
KAFB-106058	4814	7/21/20 13:30	5326.05	530.62	4814-4799	—	448.88	--	—	—	4877.17
KAFB-106059	4857	7/23/20 12:40	5347.87	510.98	4861-4841	470.40	470.41	16.47	0.01	4877.47	4877.47
KAFB-106060[f]	4838	7/23/20 12:40	5345.32	523.12	4842-4827	—	467.96	--	—	—	4877.36
KAFB-106061	4814	7/23/20 12:40	5345.43	593.04	4772-4757	—	467.93	--	—	—	4877.50
KAFB-106062[f]	4814	7/23/20 13:10	5351.20	598.10	4773-4758	—	473.91	--	—	—	4877.29
KAFB-106063[f,g]	4838	8/4/20 14:05	5351.86	528.36	4844-4829	—	474.80	--	—	—	4877.06
KAFB-106064[f,g]	4857	8/4/20 9:24	5351.08	513.18	4863-4843	—	473.90	14.18	—	—	4877.18
KAFB-106065[f]	4838	7/23/20 8:45	5348.76	528.06	4841-4826	—	471.50	--	—	—	4877.26
KAFB-106066[f]	4814	7/23/20 8:45	5349.09	595.79	4773-4758	—	471.86	--	—	—	4877.23
KAFB-106067[f]	4857	7/21/20 8:10	5347.50	509.90	4862-4842	—	470.36	15.14	—	—	4877.14
KAFB-106068[f]	4814	7/21/20 8:10	5347.23	600.03	4767-4752	—	470.30	--	—	—	4876.93
KAFB-106069	4838	7/21/20 8:10	5347.25	525.45	4841-4826	—	469.98	--	—	—	4877.27
KAFB-106070	4857	7/24/20 7:30	5318.54	483.72	4859-4839	—	441.65	17.89	—	—	4876.89
KAFB-106071	4814	7/24/20 7:30	5320.90	567.38	4773-4758	—	443.95	--	—	—	4876.95
KAFB-106072	4838	7/23/20 9:00	5319.29	494.42	4844-4824	—	442.11	--	—	—	4877.18
KAFB-106073	4838	7/22/20 7:00	5339.87	519.15	4840-4825	—	462.32	--	—	—	4877.55
KAFB-106074	4814	7/22/20 7:00	5340.59	588.94	4771-4756	—	463.08	--	—	—	4877.51
KAFB-106075[f]	4857	7/22/20 7:00	5340.50	505.00	4860-4840	—	463.04	17.46	—	—	4877.46
KAFB-106076	4857	7/23/20 10:40	5344.92	499.75	4865-4845	—	467.68	12.24	—	—	4877.24
KAFB-106077	4838	7/24/20 10:10	5344.72	522.33	4841-4826	—	468.81	--	—	—	4875.91
KAFB-106078[f]	4814	7/24/20 10:10	5344.60	593.50	4771-4756	—	467.95	--	—	—	4876.65
KAFB-106079	4857	7/23/20 13:20	5349.67	511.38	4863-4843	—	472.33	14.34	—	—	4877.34
KAFB-106080[f]	4838	7/23/20 13:20	5348.48	526.28	4843-4828	—	470.94	--	—	—	4877.54
KAFB-106081	4814	7/23/20 13:20	5349.48	596.18	4772-4757	—	472.23	--	—	—	4877.25
KAFB-106082	4857	7/22/20 8:45	5335.26	495.89	4863-4843	—	458.23	14.03	—	—	4877.03
KAFB-106083	4838	7/22/20 10:15	5335.04	514.55	4840-4825	—	457.83	--	—	—	4877.21
KAFB-106084	4814	7/22/20 8:45	5337.94	587.97	4768-4753	—	460.75	--	—	—	4877.19
KAFB-106085	4857	7/24/20 7:10	5317.23	480.89	4871-4841	—	439.97	6.26	—	—	4877.26
KAFB-106086	4838	7/24/20 7:10	5317.65	494.91	4842-4827	—	440.37	--	—	—	4877.28
KAFB-106087	4814	7/23/20 8:45	5316.87	565.25	4771-4756	—	439.55	--	—	—	4877.32
KAFB-106088	4857	7/22/20 15:00	5324.27	484.44	4864-4844	—	447.39	12.88	—	—	4876.88
KAFB-106089	4838	7/22/20 15:00	5323.54	501.81	4842-4827	—	447.08	--	—	—	4876.46
KAFB-106090	4814	7/22/20 15:00	5322.85	574.55	4768-4753	—	445.96	--	—	—	4876.89
KAFB-106091	4857	7/22/20 11:15	5314.33	479.30	4860-4840	—	437.56	16.77	—	—	4876.77
KAFB-106092	4838	7/22/20 11:15	5314.51	493.50	4841-4826	—	437.57	--	—	—	4876.94
KAFB-106093	4814	7/22/20 11:15	5314.62	563.15	4771-4756	—	437.49	--	—	—	4877.13
KAFB-106094[f]	4857	7/21/20 7:30	5345.07	509.17	4861-4841	—	467.58	16.49	—	—	4877.49
KAFB-106095	4838	7/21/20 7:30	5344.66	522.43	4841-4826	—	467.14	--	—	—	4877.52
KAFB-106096[f]	4814	7/21/20 7:30	5345.31	596.31	4769-4754	—	467.79	--	—	—	4877.52
KAFB-106097	4838	7/22/20 7:45	5347.74	526.03	4842-4827	—	470.10	--	—	—	4877.64
KAFB-106098	4814	7/22/20 7:45	5347.83	550.81	4817-4802	—	470.20	--	—	—	4877.63
KAFB-106099	4838	7/23/20 7:40	5342.85	521.03	4842-4827	—	465.05	--	—	—	4877.80
KAFB-106100	4814	7/23/20 7:40	5342.85	546.37	4817-4802	—	465.07	--	—	—	4877.78
KAFB-106101	4838	7/23/20 10:50	5340.32	514.71	4842-4826	—	462.35	--	—	—	4877.97
KAFB-106102	4814	7/23/20 10:50	5340.32	539.82	4816-4803	—	462.48	--	—	—	4877.84

Table 3-2
Groundwater Elevation and Light Non-Aqueous Phase Liquid Thickness, Q3 2020

Well Location ID	Reference Elevation Interval (ft AMSL)	Measurement Date and Time	MRP Elevation (ft AMSL)	Well Depth[a] (ft MRP)	Screened Interval (ft AMSL)	Depth to LNAPL[b] (ft MRP)	Depth to Water[b] (ft MRP)	Screen Submergence Depth[c] (ft)	Measured LNAPL Thickness (ft)	LNAPL Elevation (ft AMSL)	Groundwater Elevation Corrected for LNAPL Thickness[d] (ft AMSL)
KAFB-106103	4838	7/23/20 8:30	5328.44	505.16	4843-4828	—	452.16	--	—	—	4876.28
KAFB-106104	4814	7/24/20 7:40	5328.08	528.31	4818-4803	—	451.64	--	—	—	4876.44
KAFB-106105	4838	7/21/20 10:30	5321.96	503.99	4838-4823	—	444.62	--	—	—	4877.34
KAFB-106106	4857	7/21/20 10:30	5321.80	483.52	4868-4838	—	444.50	9.30	—	—	4877.30
KAFB-106107	4814	7/21/20 10:30	5322.12	529.22	4812-4797	—	444.73	--	—	—	4877.39
KAFB-106148-484[h]	4857	7/23/20 10:25	5344.24	479.71	4990-4860	—	466.68	-112.68	—	—	4877.56
KAFB-106149-484[h]	4857	7/23/20 9:20	5345.94	480.23	4992-4862	—	468.70	-114.76	—	—	4877.24
KAFB-106150-484[h]	4857	7/23/20 9:35	5344.10	480.12	4989-4860	466.85	467.12	-111.82	0.27	4877.25	4877.18
KAFB-106151-484[h]	4857	7/23/20 12:40	5345.49	480.00	4990-4861	—	468.47	-112.98	—	—	4877.02
KAFB-106152-484[h]	4857	7/23/20 11:10	5347.68	482.67	4992-4863	—	470.32	-114.64	—	—	4877.36
KAFB-106153-484[h]	4857	7/23/20 10:00	5348.99	480.43	4994-4865	—	471.72	-116.73	—	—	4877.27
KAFB-106154-484[h]	4857	7/23/20 10:15	5347.34	481.15	4992-4863	469.77	469.79	-114.43	0.02	4877.57	4877.57
KAFB-106155-484[h]	4857	7/23/20 10:50	5347.13	481.25	4992-4863	—	470.33	-115.20	—	—	4876.80
KAFB-106156-484[h]	4857	7/23/20 11:40	5341.19	481.91	4996-4857	—	463.67	-118.48	—	—	4877.52
KAFB-106201	4857	7/20/20 8:30	5357.00	524.06	4867-4837	—	484.36	5.64	—	—	4872.64
KAFB-106202	4838	7/20/20 8:30	5357.80	538.99	4838-4823	—	485.27	--	—	—	4872.53
KAFB-106203	4814	7/20/20 8:30	5357.52	641.99	4734-4719	—	485.61	--	—	—	4871.91
KAFB-106204	4857	7/20/20 12:50	5332.86	497.48	4870-4840	—	456.04	6.82	—	—	4876.82
KAFB-106205	4838	7/20/20 12:50	5333.29	514.51	4841-4826	—	456.51	--	—	—	4876.78
KAFB-106206	4814	7/20/20 12:50	5333.46	613.55	4740-4725	—	456.73	--	—	—	4876.73
KAFB-106207	4857	7/20/20 9:30	5344.20	507.38	4871-4841	—	469.20	3.99	—	—	4875.00
KAFB-106208	4838	7/20/20 9:30	5343.85	521.43	4841-4826	—	469.02	--	—	—	4874.83
KAFB-106209	4814	7/20/20 9:30	5343.38	623.81	4740-4726	—	468.73	--	—	—	4874.65
KAFB-106211[g]	4857	7/23/20 10:00	5342.51	4875.79	4903-4875.79	—	465.28	-27.77	—	—	4877.23
KAFB-106212	4814	7/22/20 14:00	5321.80	562.85	4779-4764	—	445.95	--	—	—	4875.85
KAFB-106213	4857	7/22/20 13:15	5325.19	482.72	4877-4847	—	448.62	-0.43	—	—	4876.57
KAFB-106214	4838	7/22/20 13:15	5325.45	497.75	4847-4833	—	448.86	--	—	—	4876.59
KAFB-106215	4814	7/22/20 13:15	5325.77	566.83	4779-4764	—	449.08	--	—	—	4876.69
KAFB-106216	4857	7/20/20 13:15	5333.91	489.83	4878-4848	—	457.20	-1.29	—	—	4876.71
KAFB-106217	4838	7/20/20 13:15	5333.85	505.39	4849-4834	—	457.12	--	—	—	4876.73
KAFB-106218	4814	7/20/20 13:15	5333.64	572.33	4782-4767	—	457.30	--	—	—	4876.34
KAFB-106219	4857	7/20/20 9:00	5340.41	498.89	4878-4848	—	464.20	-1.79	—	—	4876.21
KAFB-106220	4838	7/20/20 9:00	5340.34	513.49	4847-4832	—	464.12	--	—	—	4876.22
KAFB-106221	4814	7/20/20 9:00	5340.10	581.24	4779-4764	—	463.88	--	—	—	4876.22
KAFB-106222	4857	7/20/20 13:40	5333.24	493.32	4875-4845	—	456.56	1.68	—	—	4876.68
KAFB-106223	4838	7/20/20 13:40	5333.96	506.65	4846-4831	—	457.21	--	—	—	4876.75
KAFB-106224	4814	7/20/20 13:40	5335.08	575.88	4780-4765	—	458.34	--	—	—	4876.74
KAFB-106225	4857	7/21/20 11:45	5326.36	483.02	4876-4846	—	449.63	0.73	—	—	4876.73
KAFB-106226	4838	7/21/20 11:45	5327.31	500.11	4847-4832	—	450.27	--	—	—	4877.04
KAFB-106227	4814	7/21/20 11:45	5328.09	568.39	4780-4765	—	451.04	--	—	—	4877.05
KAFB-106229[e,h]	4857/4838	7/21/20 14:10	5314.31	536.26	4883-4783	—	437.99	-6.68	—	—	4876.32
KAFB-106230	4814	7/21/20 12:30	5324.51	520.25	4824-4809	—	447.54	--	—	—	4876.97
KAFB-106231	4857	7/20/20 9:50	5327.56	479.85	4888-4853	—	450.38	-10.82	—	—	4877.18
KAFB-106232	4814	7/20/20 9:50	5327.20	523.06	4824-4809	—	450.00	--	—	—	4877.20
KAFB-106235-438	4857	7/20/20 14:10	5315.67	465.11	4878-4853	—	438.19	-0.52	—	—	4877.48
KAFB-106235-472	4838	7/20/20 14:10	5315.67	495.19	4844-4824	—	438.20	--	—	—	4877.47
KAFB-106235-501	4814	7/20/20 14:10	5315.67	521.78	4815-4795	—	438.28	--	—	—	4877.39
KAFB-106236-436	4857	7/20/20 12:30	5316.02	463.36	4880-4855	—	438.24	-2.22	—	—	4877.78
KAFB-106236-470	4838	7/20/20 12:30	5316.02	494.11	4846-4826	—	438.27	--	—	—	4877.75
KAFB-106236-499	4814	7/20/20 12:30	5316.02	520.63	4817-4797	—	438.30	--	—	—	4877.72
KAFB-106240-449	4857	7/22/20 8:15	5347.57	491.00	4899-4859	—	470.09	-21.52	—	—	4877.48

Table 3-2
Groundwater Elevation and Light Non-Aqueous Phase Liquid Thickness, Q3 2020

Well Location ID	Reference Elevation Interval (ft AMSL)	Measurement Date and Time	MRP Elevation (ft AMSL)	Well Depth[a] (ft MRP)	Screened Interval (ft AMSL)	Depth to LNAPL[b] (ft MRP)	Depth to Water[b] (ft MRP)	Screen Submergence Depth[c] (ft)	Measured LNAPL Thickness (ft)	LNAPL Elevation (ft AMSL)	Groundwater Elevation Corrected for LNAPL Thickness[d] (ft AMSL)
KAFB-106241-428	4857	7/21/20 11:00	5324.06	470.12	4896-4856	—	447.51	-19.45	—	—	4876.55
KAFB-106242-418	4857	7/20/20 11:50	5316.15	460.00	4898-4858	—	438.64	-20.49	—	—	4877.51
KAFB-106243-425	4857	7/22/20 15:00	5320.57	467.60	4896-4856	—	443.61	-19.04	—	—	4876.96
KAFB-106244-445	4857	7/23/20 7:40	5343.51	487.09	4898-4858	—	465.85	-20.34	—	—	4877.66
KAFB-106245-460	4857	7/23/20 11:40	5360.90	505.52	4897-4857	—	483.90	-20.00	—	—	4877.00
KAFB-106247-450	4857	7/24/20 9:45	5351.60	495.10	4901-4861	—	474.37	-23.77	—	—	4877.23
KAFB-106S1-447	4857	7/23/20 9:25	5345.22	489.40	4898-4858	—	467.76	-20.54	—	—	4877.46
KAFB-106S2-451	4857	7/23/20 12:15	5352.40	496.41	4898-4858	—	474.96	-20.56	—	—	4877.44
KAFB-106S3-449	4857	7/23/20 13:40	5351.01	493.61	4899-4859	—	474.00	-21.99	—	—	4877.01
KAFB-106S4-446	4857	7/23/20 6:40	5346.57	491.12	4898-4858	—	469.09	-20.52	—	—	4877.48
KAFB-106S5-446	4857	7/23/20 7:45	5343.58	488.16	4898-4858	—	466.13	-20.55	—	—	4877.45
KAFB-106S7-451	4857	7/23/20 7:45	5348.88	492.00	4898-4858	—	471.60	-20.72	—	—	4877.28
KAFB-106S8-451	4857	7/23/20 9:50	5351.45	491.44	4900-4860	—	474.08	-22.63	—	—	4877.37
KAFB-106S9-447	4857	7/23/20 12:40	5345.82	489.24	4899-4859	—	468.68	-21.86	—	—	4877.14
KAFB-3411	4857	7/24/20 9:30	5343.49	504.71	4863-4838	—	465.92	14.57	—	—	4877.57

[a] Well depths were measured in December 2019 in wells without a dedicated pump. For wells with a dedicated pump, the total depth is based on the information provided in the well completion diagram.

[b] See appendix table E-2-1 for corrections to water level and LNAPL depths based on interface probe calibration.

[c] Screen submergence depth is calculated for wells which intersected the water table when they were installed; those located in REI 4857 and 4857/4838. It is the difference between the groundwater elevation corrected for LNAPL thickness and the top of screen elevation. Negative values reflect the length of screen remaining above the water table.

[d] Groundwater elevation corrected for LNAPL thickness was calculated by the following formula: MRP Elevation - Depth to LNAPL/water interface + (LNAPL Thickness * Specific Gravity of Weathered JP4/JP8 Fuel) where the specific gravity of JP4/JP8 fuel is 0.7592. The specific gravity is based on the December 13, 2018 site-specific fuel testing report from PTS Laboratories using LNAPL collected from wells KAFB-106014, KAFB-106059, and KAFB-106079.

[e] Well used in analyses for both REI 4857 and 4838.

[f] This well contains a dedicated pump; therefore, a sounder was not deployed to avoid entanglement and the total depth is based on the information provided in the well completion diagram.

[g] Well was not gauged in July due to presence of monitoring equipment. Gauging occurred prior to sampling in August and is presented here for information purposes only. Data was not used in the creation of potentiometric surface maps.

[h] Well not permanently designated in REI listed.

-- = Well was designed with the screened interval fully submerged to capture conditions at depths below the water table
— = LNAPL not detected
AMSL = above mean sea level
ft = foot/feet
ID = identification
JP = jet propellant
LNAPL = light non-aqueous phase liquid
MRP = measurement reference point
Q3 = third quarter
REI = reference elevation interval

Table 3-3
Groundwater Monitoring Wells Sampled in Q3 2020

Location ID	Reference Elevation Interval (ft AMSL)	Well Installation Date[a]	Date Sampled	Screen Interval[b] (ft bgs)	Screen Interval[b] (ft AMSL)	Sampling System	Screen Submerged[c] (Yes/No)?	Estimated Pump Intake Depth[d,e,f] (ft bgs)	Analytical Suite[g]
Reference Elevation Interval 4857 (ft AMSL) Groundwater Monitoring Wells									
KAFB-106003	4857	1/25/2003	7/15/2020	476-501	4861-4836	Portable pump	Yes	478	BTEX, EDB, FP
KAFB-106004	4857	1/4/2006	7/16/2020	484-509	4859-4834	Portable pump	Yes	486	BTEX, EDB, FP
KAFB-106005	4857	1/22/2007	7/13/2020	479-504	4865-4840	Portable pump	Yes	481	BTEX, EDB, metals, anions, alkalinity,FP
KAFB-106009	4857	11/28/2007	7/9/2020	480-505	4865-4840	Passive sampler	Yes	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106012R	4857	4/22/2014	7/14/2020	466-495	4877-4847	Portable pump	Yes	468	BTEX, EDB, metals, anions, alkalinity, FP
KAFB-106013	4857	9/19/2008	7/15/2020	487-512	4861-4836	Portable pump	Yes	489	BTEX, EDB, FP
KAFB-106029	4857	6/4/2011	7/9/2020	451-471	4860-4840	Passive sampler	Yes	--	EDB
KAFB-106032	4857	6/24/2011	7/8/2020	456-476	4862-4842	Passive sampler	Yes	--	EDB
KAFB-106041	4857	6/6/2011	7/8/2020	449-469	4875-4855	Passive sampler	Yes	--	EDB, metals, anions, alkalinity
KAFB-106049	4857	5/13/2011	7/8/2020	457-477	4859-4839	Passive sampler	Yes	--	EDB
KAFB-106149-484	4857	9/16/2011	7/10/2020	354-484	4992-4862	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106151-484	4857	9/30/2011	7/10/2020	355-484	4990-4861	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106152-484	4857	10/7/2011	7/10/2020	355-484	4992-4863	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106153-484	4857	10/27/2011	7/10/2020	355-484	4994-4865	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106201	4857	9/24/2012	7/9/2020	487-517	4867-4837	Passive sampler	Yes	--	EDB
KAFB-106204	4857	8/22/2012	7/7/2020	463-493	4870-4840	Passive sampler	Yes	--	EDB
KAFB-106207	4857	8/22/2012	7/7/2020	473-503	4871-4841	Passive sampler	Yes	--	EDB
KAFB-106216	4857	2/17/2015	7/7/2020	456-486	4878-4848	Passive sampler	No	--	EDB
KAFB-106222	4857	1/15/2015	7/7/2020	458-488	4875-4845	Passive sampler	Yes	--	EDB
KAFB-106231	4857	9/15/2015	7/7/2020	440-475	4888-4853	Passive sampler	No	--	EDB
KAFB-106235-438	4857	10/31/2016	7/6/2020	438-463	4878-4853	Passive sampler	Yes	--	EDB
KAFB-106236-436	4857	11/23/2016	7/6/2020	436-461	4880-4855	Passive sampler	No	--	EDB
KAFB-106240-449	4857	6/14/2018	7/8/2020	449-489	4899-4859	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106241-428	4857	8/16/2018	7/8/2020	428-468	4896-4856	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106242-418	4857	8/23/2018	7/7/2020	418-458	4898-4858	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106243-425	4857	7/27/2018	7/9/2020	425-465	4896-4856	Passive sampler	No	--	EDB, metals, anions, alkalinity
KAFB-106244-445	4857	7/12/2018	7/8/2020	445-485	4898-4858	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106245-460	4857	9/7/2018	7/9/2020	461-501	4897-4857	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106247-450	4857	3/1/2019	7/8/2020	450-490	4898-4858	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S1-447	4857	2/18/2019	7/10/2020	447-487	4898-4858	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S2-451	4857	11/21/2018	7/10/2020	451-491	4898-4858	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S3-449	4857	11/29/2018	7/10/2020	449-489	4899-4859	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S4-446	4857	11/16/2018	7/9/2020	446-486	4897-4857	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S5-446	4857	11/5/2018	7/10/2020	446-486	4898-4858	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S7-451	4857	2/4/2019	7/10/2020	451-491	4898-4858	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S8-451	4857	3/1/2019	7/10/2020	451-491	4897-4857	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity
KAFB-106S9-447	4857	11/8/2019	7/10/2020	447-487	4899-4859	Passive sampler	No	--	BTEX, EDB, metals, anions, alkalinity

Table 3-3
Groundwater Monitoring Wells Sampled in Q3 2020

Location ID	Reference Elevation Interval (ft AMSL)	Well Installation Date[a]	Date Sampled	Screen Interval[b] (ft bgs)	Screen Interval[b] (ft AMSL)	Sampling System	Screen Submerged[c] (Yes/No)?	Estimated Pump Intake Depth[d,e,f] (ft bgs)	Analytical Suite[g]
Reference Elevation Interval 4838 (ft AMSL) Groundwater Monitoring Wells									
KAFB-106030	4838	5/25/2011	7/9/2020	470-485	4842-4827	Passive sampler	Yes	--	EDB
KAFB-106033	4838	6/18/2011	7/8/2020	477-492	4841-4826	Passive sampler	Yes	--	EDB
KAFB-106050	4838	5/2/2011	7/8/2020	474-489	4841-4826	Passive sampler	Yes	--	EDB
KAFB-106097	4838	4/27/2011	7/16/2020	506-521	4842-4827	Portable pump	Yes	508	BTEX, EDB, FP
KAFB-106099	4838	5/12/2011	7/16/2020	501-516	4842-4827	Portable pump	Yes	503	BTEX, EDB, FP
KAFB-106101	4838	2/21/2011	7/15/2020	496-511	4842-4826	Portable pump	Yes	498	BTEX, EDB, FP
KAFB-106202	4838	9/23/2012	7/9/2020	517-532	4838-4823	Passive sampler	Yes	--	EDB
KAFB-106205	4838	8/15/2012	7/7/2020	493-508	4841-4826	Passive sampler	Yes	--	EDB
KAFB-106208	4838	8/16/2012	7/7/2020	503-518	4841-4826	Passive sampler	Yes	--	EDB
KAFB-106217	4838	2/17/2015	7/7/2020	485-500	4849-4834	Passive sampler	Yes	--	EDB
KAFB-106223	4838	2/17/2015	7/7/2020	488-503	4846-4831	Passive sampler	Yes	--	EDB
KAFB-106235-472	4838	10/31/2016	7/6/2020	472-492	4844-4824	Passive sampler	Yes	--	EDB
KAFB-106236-470	4838	11/23/2016	7/6/2020	470-490	4846-4826	Passive sampler	Yes	--	EDB
Reference Elevation Interval 4814 (ft AMSL) Groundwater Monitoring Wells									
KAFB-106031	4814	5/25/2011	7/9/2020	496-510	4815-4802	Passive sampler	Yes	--	EDB
KAFB-106034	4814	6/24/2011	7/8/2020	502-517	4817-4802	Passive sampler	Yes	--	EDB
KAFB-106051	4814	4/26/2011	7/8/2020	501-516	4815-4800	Passive sampler	Yes	--	EDB
KAFB-106098	4814	4/17/2011	7/15/2020	531-546	4817-4802	Portable pump	Yes	533	BTEX, EDB, FP
KAFB-106100	4814	5/3/2011	7/16/2020	526-541	4817-4802	Portable pump	Yes	528	BTEX, EDB, FP
KAFB-106102	4814	3/3/2011	7/15/2020	521-535	4816-4803	Portable pump	Yes	523	BTEX, EDB, FP
KAFB-106203	4814	9/9/2012	7/9/2020	620-635	4734-4719	Passive sampler	Yes	--	EDB
KAFB-106206	4814	7/16/2012	7/7/2020	594-608	4740-4725	Passive sampler	Yes	--	EDB
KAFB-106209	4814	8/7/2012	7/7/2020	603-617	4740-4726	Passive sampler	Yes	--	EDB
KAFB-106218	4814	5/26/2015	7/7/2020	552-567	4782-4767	Passive sampler	Yes	--	EDB
KAFB-106224	4814	5/22/2015	7/7/2020	555-570	4780-4765	Passive sampler	Yes	--	EDB
KAFB-106230	4814	9/1/2015	7/8/2020	501-516	4824-4809	Passive sampler	Yes	--	EDB, metals, anions, alkalinity
KAFB-106232	4814	9/15/2015	7/7/2020	503-518	4824-4809	Passive sampler	Yes	--	EDB
KAFB-106235-501	4814	10/31/2016	7/6/2020	501-521	4815-4795	Passive sampler	Yes	--	EDB
KAFB-106236-499	4814	11/23/2016	7/6/2020	499-519	4817-4797	Passive sampler	Yes	--	EDB

Table 3-3
Groundwater Monitoring Wells Sampled in Q3 2020

[a] Well installation date is the date provided in ERPIMS, except where the date in ERPIMS is the start of drilling, in which case the well installation date is the date provided in the well completion diagram submitted to the NMOSE.

[b] Screen interval is rounded to the nearest foot.

[c] Well screens in REI 4857 wells intersected the water table when they were installed and current screen submergence is the result of water table rise. Well screens in REI 4838 and 4814 wells were designed with the screened interval fully submerged to capture conditions at depths below the water table.

[d] Portable equipment sampling depths are estimated to the nearest foot due to slight inaccuracies with the mechanism measuring the pump setting in the field.

[e] Portable pump setting estimated as 2 ft below top of screen if submerged or 2 ft above bottom of screen if not submerged.

[f] Dedicated pump setting estimated as half-way between top and bottom of screen.

[g] The analytical methods for EDB and VOCs (including BTEX) are 8011 and 8260C, respectively. Metals analyses consisted of select total metals (arsenic, calcium, lead, potassium, magnesium, and sodium by analytical Method 6020A/6010C and select and dissolved metals (iron and manganese) (6010C). Anions analysis consisted of bromide by Method 300.0A, chloride by Method 300.0A, nitrate/nitrite nitrogen by Method 353.2, and sulfate by Method 300.0A. Field parameters include pH, specific conductivity, dissolved oxygen, oxidation reduction potential, temperature, and turbidity.

-- = pump intake depth is not applicable for passive samples
AMSL = above mean sea level
bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, and total xylene
EDB = ethylene dibromide
ERPIMS = Environmental Resources Program Information Management System
FP = field parameters
ft = foot/feet
ID = identification
NMOSE = New Mexico Office of the State Engineer
Q3 = third quarter
REI = reference elevation interval
VOC = volatile organic compound

Table 3-4
Groundwater Analytical Results for Newly Added Wells, Q3 2020

Parameter	Analytical Method	Analyte	NMAC NMWQCC[a]	EPA MCL[b]	EPA RSL[c]	Project Screening Level[d]	Result	Val Qual	LOD
						Well Location ID:	KAFB-106S7-451		
						Field Sample ID:	GWS7-451-203		
						Sample Date:	7/10/2020		
						Sample Type:	REG		
						Sample Depth (ft bgs):	475.1		
						Reference Elevation Interval (ft AMSL):	4857		
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	**36**	--	3.8
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	**520**	--	5
		Ethylbenzene	750	700	15	700	**1,000**	--	8
		Toluene	1,000	1,000	1,100	1,000	**1,700**	--	5
		Xylenes, total	620	10,000	190	620	**3,300**	--	20
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	100	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	**1.1**	--	0.1
		Magnesium	NS	NS	NS	NS	16	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	**3.5**	--	0.0052
		Potassium	NS	NS	NS	NS	3.2	--	0.38
		Sodium	NS	NS	NS	NS	37	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.0078	--	0.0016
		Lead	0.015	0.015	0.015	0.015	0.000083	J	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	ND	U	2
		Chloride	250	250	NS	250	25	J	1.5
		Sulfate	600	250	NS	250	3.2	J	4.5
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	ND	U	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as CaCO3)	NS	NS	NS	NS	330	--	6
		Alkalinity, carbonate (as CaCO3)	NS	NS	NS	NS	ND	U	6
		Alkalinity, total (as CaCO3)	NS	NS	NS	NS	330	--	6

[a] NMWQCC numeric standards per the NMAC Title 20.6.2.3101A, Standards for Ground Water of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC 2018). For metals, the NMWQCC numeric standard applies to dissolved metals.

[b] EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Part 141, 143 (May 2018).

[c] EPA Region 6 RSL for Tapwater (May 2020) for hazard index = 1.0 for noncarcinogens and a 10-5 cancer risk level for carcinogens.

[d] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC standard or MCL exists for any analyte, then the project screening level will be the EPA RSL.

[e] Based on the geochemical equilibrium of the site groundwater and previous site data analyses, nitrate/nitrite results represent nitrate concentrations.

µg/L = microgram per liter
AFB = Air Force Base
AMSL = above mean sea level
bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, and total xylenes
$CaCO_3$ = calcium carbonate
CFR = Code of Federal Regulations
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ft = foot (feet)
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
mg/L = milligram per liter
ND = not detected
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
NS = not specified
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
Val Qual = validation qualifier
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation:
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
-- = Validation qualifier not assigned.

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106003			KAFB-106004			KAFB-106005			KAFB-106009		
						Field Sample ID:	GW003-203			GW004-203			GW005-203			GW009-203		
						Sample Date:	7/15/2020			7/16/2020			7/13/2020			7/9/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	482			488.74			482.57			484.39		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.02	**1.9**	J	0.39	0.019	J	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	ND	U	0.5	ND	U	0.5	**1,700**	--	10	ND	U	0.5
		Ethylbenzene	750	700	15	700	ND	U	0.8	ND	U	0.8	220	--	1.6	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	**1,800**	--	10	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	**840**	--	4	ND	U	2

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106009			KAFB-106012R			KAFB-106012R			KAFB-106013		
						Field Sample ID:	GW009-603			GW012R-203			GW012R-603			GW013-203		
						Sample Date:	7/9/2020			7/14/2020			7/14/2020			7/15/2020		
						Sample Type:	Field Duplicate			REG			Field Duplicate			REG		
						Sample Depth (ft bgs):	484.39			495			495			491		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	0.02	J	0.019	ND	U	0.019	ND	U	0.019	ND	UJ	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	750	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106029			KAFB-106030			KAFB-106031			KAFB-106032		
						Field Sample ID:	GW029-203			GW030-203			GW031-203			GW032-203		
						Sample Date:	7/9/2020			7/9/2020			7/9/2020			7/8/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	451.5			470.2			496.5					
						Reference Elevation Interval (ft AMSL):	4857			4838			4814			4857		
Parameter	Analytical Method	Analyte	NMAC NMWQCC[a]	EPA MCL[b]	EPA RSL[c]	Project Screening Level[d]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106033			KAFB-106034			KAFB-106041			KAFB-106049		
						Field Sample ID:	GW033-203			GW034-203			GW041-203			GW049-203		
						Sample Date:	7/8/2020			7/8/2020			7/8/2020			7/8/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):												
						Reference Elevation Interval (ft AMSL):	4838			4814			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	0.016	J	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106050			KAFB-106051			KAFB-106051			KAFB-106097		
						Field Sample ID:	GW050-203			GW051-203			GW051-603			GW097-203		
						Sample Date:	7/8/2020			7/8/2020			7/8/2020			7/16/2020		
						Sample Type:	REG			REG			Field Duplicate			REG		
						Sample Depth (ft bgs):										508		
						Reference Elevation Interval (ft AMSL):	4838			4814			4814			4838		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	ND	U	0.5
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	ND	U	0.5
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	ND	U	2

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106098			KAFB-106099			KAFB-106100			KAFB-106101		
						Field Sample ID:	GW098-203			GW099-203			GW100-203			GW101-203		
						Sample Date:	7/15/2020			7/16/2020			7/16/2020			7/15/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	533			503			528			505		
						Reference Elevation Interval (ft AMSL):	4814			4838			4814			4838		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	750	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106102			KAFB-106149-484			KAFB-106151-484			KAFB-106152-484		
						Field Sample ID:	GW102-203			GW149-484-203			GW151-484-203			GW152-484-203		
						Sample Date:	7/15/2020			7/10/2020			7/10/2020			7/10/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	526			472			472.19			474.88		
						Reference Elevation Interval (ft AMSL):	4814			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC**[a]	**EPA MCL**[b]	**EPA RSL**[c]	**Project Screening Level**[d]	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	**11**	--	1.9	0.023	J	0.019	0.019	J	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	ND	U	0.5	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	ND	U	0.8	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	ND	U	2	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106153-484			KAFB-106201			KAFB-106202			KAFB-106203		
						Field Sample ID:	GW153-484-203			GW201-203			GW202-203			GW203-203		
						Sample Date:	7/10/2020			7/9/2020			7/9/2020			7/9/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	474.89			490.35			520.6			623.78		
						Reference Elevation Interval (ft AMSL):	4857			4857			4838			4814		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	**30**	--	3.8	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106204			KAFB-106205			KAFB-106206			KAFB-106207		
						Field Sample ID:	GW204-203			GW205-203			GW206-203			GW207-203		
						Sample Date:	7/7/2020			7/7/2020			7/7/2020			7/7/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	463.2			493.2			594.2			473.7		
						Reference Elevation Interval (ft AMSL):	4857			4838			4814			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106208			KAFB-106209			KAFB-106216			KAFB-106216		
						Field Sample ID:	GW208-203			GW209-203			GW216-203			GW216-603		
						Sample Date:	7/7/2020			7/7/2020			7/7/2020			7/7/2020		
						Sample Type:	REG			REG			REG			Field Duplicate		
						Sample Depth (ft bgs):	503.7			603.7			461.4			461.4		
						Reference Elevation Interval (ft AMSL):	4838			4814			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC**[a]	**EPA MCL**[b]	**EPA RSL**[c]	**Project Screening Level**[d]	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106217			KAFB-106218			KAFB-106222			KAFB-106223		
						Field Sample ID:	GW217-203			GW218-203			GW222-203			GW223-203		
						Sample Date:	7/7/2020			7/7/2020			7/7/2020			7/7/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	485.7			552.7			461.1			488.5		
						Reference Elevation Interval (ft AMSL):	4838			4814			4857			4838		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106224			KAFB-106230			KAFB-106231			KAFB-106232		
						Field Sample ID:	GW224-203			GW230-203			GW231-203			GW232-203		
						Sample Date:	7/7/2020			7/8/2020			7/7/2020			7/7/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	555.7						453.7			503.7		
						Reference Elevation Interval (ft AMSL):	4814			4814			4857			4814		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106235-438			KAFB-106235-438			KAFB-106235-472			KAFB-106235-501		
						Field Sample ID:	GW235-438-203			GW235-438-603			GW235-472-203			GW235-501-203		
						Sample Date:	7/6/2020			7/6/2020			7/6/2020			7/6/2020		
						Sample Type:	REG			Field Duplicate			REG			REG		
						Sample Depth (ft bgs):	443.9			443.9			472.7			501.7		
						Reference Elevation Interval (ft AMSL):	4857			4857			4838			4814		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC**[a]	**EPA MCL**[b]	**EPA RSL**[c]	**Project Screening Level**[d]	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106236-436			KAFB-106236-470			KAFB-106236-499			KAFB-106240-449		
						Field Sample ID:	GW236-436-203			GW236-470-203			GW236-499-203			GW240-449-203		
						Sample Date:	7/6/2020			7/6/2020			7/6/2020			7/8/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	441.9			470.7			499.7					
						Reference Elevation Interval (ft AMSL):	4857			4838			4814			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	ND	U	0.02
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	ND	U	0.5
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	ND	U	0.5
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	ND	U	2

Table 3-5

Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106241-428			KAFB-106242-418			KAFB-106243-425			KAFB-106243-425		
						Field Sample ID:	GW241-428-203			GW242-418-203			GW243-425-203			GW243-425-603		
						Sample Date:	7/8/2020			7/7/2020			7/9/2020			7/9/2020		
						Sample Type:	REG			REG			REG			Field Duplicate		
						Sample Depth (ft bgs):				442.24			449.14			449.14		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.019	ND	U	0.02	0.035	--	0.019	0.03	--	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	—	—	—	—	—	—	—	—	—	—	—	—
		Ethylbenzene	750	700	15	700	—	—	—	—	—	—	—	—	—	—	—	—
		Toluene	1,000	1,000	1,100	1,000	—	—	—	—	—	—	—	—	—	—	—	—
		Xylenes, total	620	10,000	190	620	—	—	—	—	—	—	—	—	—	—	—	—

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106244-445			KAFB-106245-460			KAFB-106247-450			KAFB-106S1-447		
						Field Sample ID:	GW244-445-203			GW245-460-203			GW247-450-203			GWS1-447-203		
						Sample Date:	7/8/2020			7/9/2020			7/8/2020			7/10/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):				487.77						471.12		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	ND	U	0.02	ND	U	0.019	ND	U	0.019	**28**	J	3.9
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	**5,000**	--	50
		Ethylbenzene	750	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	500	J	8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	**6,300**	--	50
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	**2,800**	J	20

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106S2-451			KAFB-106S3-449			KAFB-106S4-446			KAFB-106S5-446		
						Field Sample ID:	GWS2-451-203			GWS3-449-203			GWS4-446-203			GWS5-446-203		
						Sample Date:	7/10/2020			7/10/2020			7/9/2020			7/10/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	478.15			478.91			473.04			470.1		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	**150**	--	38	**75**	--	9.6	0.035	--	0.019	**3.1**	--	0.39
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	**1,100**	--	5	**200**	--	5	ND	U	0.5	**990**	--	10
		Ethylbenzene	750	700	15	700	130	--	8	24	--	8	ND	U	0.8	**1,300**	--	16
		Toluene	1,000	1,000	1,100	1,000	320	--	5	5	J	5	ND	U	0.5	**3,400**	--	10
		Xylenes, total	620	10,000	190	620	**1,200**	--	20	450	--	20	ND	U	2	**2,400**	--	40

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106S8-451			KAFB-106S8-451			KAFB-106S9-447		
						Field Sample ID:	GWS8-451-203			GWS8-451-603			GWS9-447-203		
						Sample Date:	7/10/2020			7/10/2020			7/10/2020		
						Sample Type:	REG			Field Duplicate			REG		
						Sample Depth (ft bgs):	478.32			478.32			473.7		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.05	0.05	0.075	0.05	**310**	--	38	**370**	--	39	**0.21**	--	0.019
BTEX	Method SW8260C (µg/L)	Benzene	10	5	4.5	5	**5,000**	--	50	**4,800**	--	25	**4,200**	--	50
		Ethylbenzene	750	700	15	700	150	--	80	150	--	40	620	--	8
		Toluene	1,000	1,000	1,100	1,000	**3,300**	--	50	**3,200**	--	25	**1,700**	--	5
		Xylenes, total	620	10,000	190	620	**2,000**	--	200	**2,000**	--	100	**1,300**	--	20

Table 3-5
Groundwater Analytical Results for Organic Compounds for Groundwater Monitoring Wells, Q3 2020

[a] NMWQCC numeric standards per the NMAC Title 20.6.2.3101A, Standards for Ground Water of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC 2018). For metals, the NMWQCC numeric standard applies to dissolved metals.

[b] EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Part 141, 143 (May 2018).

[c] EPA Region 6 RSL for Tapwater (May 2020) for hazard index = 1.0 for noncarcinogens and a 10-5 cancer risk level for carcinogens.

[d] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC standard or MCL exists for any analyte, then the project screening level will be the EPA RSL.

— = Compound not analyzed for.
µg/L = microgram per liter
AFB = Air Force Base
AMSL = above mean sea level
bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, and total xylenes
CFR = Code of Federal Regulations
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ft = foot (feet)
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
ND = not detected
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
Val Qual = validation qualifier
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation:

J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.

U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.

-- = Validation qualifier not assigned.

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106005			KAFB-106009			KAFB-106009			KAFB-106012R		
						Field Sample ID:	GW005-203			GW009-203			GW009-603			GW012R-203		
						Sample Date:	7/13/2020			7/9/2020			7/9/2020			7/14/2020		
						Sample Type:	REG			REG			Field Duplicate			REG		
						Sample Depth (ft bgs):	482.57			484.39			484.39			495		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	160	--	0.15	140	--	0.15	140	--	0.15	150	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	0.17	J	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Magnesium	NS	NS	NS	NS	29	--	0.075	20	--	0.075	20	--	0.075	23	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	**1.6**	--	0.0052	0.008	J	0.0052	0.0043	J	0.0052	ND	U	0.0052
		Potassium	NS	NS	NS	NS	4.4	--	0.38	3.7	--	0.38	3.6	--	0.38	4.6	--	0.38
		Sodium	NS	NS	NS	NS	70	--	0.5	45	--	0.5	45	--	0.5	63	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.00097	J	0.0016	ND	U	0.0016	ND	U	0.0016	ND	U	0.0016
		Lead	0.015	0.015	0.015	0.015	ND	U	0.00025	ND	U	0.00025	ND	U	0.00025	0.0019	--	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	3.2	--	2	2.8	--	2	2.9	--	2	ND	U	2
		Chloride	250	250	NS	250	200	--	15	180	J	150	210	--	150	200	--	150
		Sulfate	600	250	NS	250	95	--	45	230	J	450	**340**	J	450	**390**	J	450
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	ND	U	0.09	1.7	--	0.09	1.7	--	0.09	3.9	--	0.45
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	310	--	6	140	--	6	170	--	6	110	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	310	--	6	140	--	6	170	--	6	110	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106012R			KAFB-106041			KAFB-106149-484			KAFB-106151-484		
						Field Sample ID:	GW012R-603			GW041-203			GW149-484-203			GW151-484-203		
						Sample Date:	7/14/2020			7/8/2020			7/10/2020			7/10/2020		
						Sample Type:	Field Duplicate			REG			REG			REG		
						Sample Depth (ft bgs):	495						472			472.19		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	160	--	0.15	91	--	0.15	62	--	0.15	190	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	ND	U	0.1	ND	U	0.1	0.047	J	0.1	ND	U	0.1
		Magnesium	NS	NS	NS	NS	24	--	0.075	12	--	0.075	9.2	--	0.075	26	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	U	0.0052	**0.84**	--	0.0052	ND	U	0.0052
		Potassium	NS	NS	NS	NS	4.6	--	0.38	3.7	--	0.38	2.9	--	0.38	4.4	--	0.38
		Sodium	NS	NS	NS	NS	64	--	0.5	32	--	0.5	28	--	0.5	42	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.0007	J	0.0016	ND	U	0.0016	0.0025	--	0.0016	ND	U	0.0016
		Lead	0.015	0.015	0.015	0.015	0.0016	--	0.00025	ND	U	0.00025	0.00088	--	0.00025	ND	U	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	ND	U	2	ND	U	2	ND	U	2	ND	U	40
		Chloride	250	250	NS	250	190	J	150	57	--	15	11	--	1.5	71	--	30
		Sulfate	600	250	NS	250	**400**	J	450	99	--	45	ND	U	4.5	**350**	--	90
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	4.2	--	0.18	2.4	--	0.09	ND	U	0.09	ND	U	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	110	--	6	98	--	6	240	--	6	160	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	110	--	6	98	--	6	240	--	6	160	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106152-484			KAFB-106153-484			KAFB-106230			KAFB-106240-449		
						Field Sample ID:	GW152-484-203			GW153-484-203			GW230-203			GW240-449-203		
						Sample Date:	7/10/2020			7/10/2020			7/8/2020			7/8/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	474.88			474.89								
						Reference Elevation Interval (ft AMSL):	4857			4857			4814			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	170	--	0.15	130	--	0.15	44	--	0.15	83	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	**1.4**	--	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Magnesium	NS	NS	NS	NS	26	--	0.075	19	--	0.075	6.1	--	0.075	12	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	**4.6**	--	0.0052	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
		Potassium	NS	NS	NS	NS	4.1	--	0.38	3.5	--	0.38	2.5	--	0.38	3.1	--	0.38
		Sodium	NS	NS	NS	NS	44	--	0.5	37	--	0.5	23	--	0.5	29	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.0032	--	0.0016	0.002	--	0.0016	0.00098	J	0.0016	0.001	J	0.0016
		Lead	0.015	0.015	0.015	0.015	0.00034	J	0.00025	0.00011	J	0.00025	0.00021	J	0.00025	ND	U	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	1.3	J	2	1.3	J	2	ND	U	2	ND	U	2
		Chloride	250	250	NS	250	70	--	15	13	--	1.5	30	--	1.5	130	J	150
		Sulfate	600	250	NS	250	1.5	J	4.5	ND	U	4.5	53	--	4.5	71	--	4.5
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	ND	U	0.09	ND	U	0.09	0.72	--	0.09	1.9	--	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	490	--	6	350	--	6	97	--	6	160	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	490	--	6	350	--	6	97	--	6	160	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106241-428			KAFB-106242-418			KAFB-106243-425			KAFB-106243-425		
						Field Sample ID:	GW241-428-203			GW242-418-203			GW243-425-203			GW243-425-603		
						Sample Date:	7/8/2020			7/7/2020			7/9/2020			7/9/2020		
						Sample Type:	REG			REG			REG			Field Duplicate		
						Sample Depth (ft bgs):				442.24			449.14			449.14		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	54	--	0.15	170	--	0.15	48	--	0.15	49	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	ND	U	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Magnesium	NS	NS	NS	NS	7.5	--	0.075	22	--	0.075	6.4	--	0.075	6.7	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
		Potassium	NS	NS	NS	NS	2.7	--	0.38	4.5	--	0.38	2.5	--	0.38	2.5	--	0.38
		Sodium	NS	NS	NS	NS	28	--	0.5	45	--	0.5	24	--	0.5	25	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.00081	J	0.0016	0.00083	J	0.0016	0.0014	J	0.0016	0.0013	J	0.0016
		Lead	0.015	0.015	0.015	0.015	ND	U	0.00025	ND	U	0.00025	0.000083	J	0.00025	ND	U	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	ND	U	2	2.2	J	2	ND	U	2	ND	U	2
		Chloride	250	250	NS	250	41	--	15	130	--	60	20	--	1.5	21	--	1.5
		Sulfate	600	250	NS	250	50	--	4.5	**280**	--	180	40	--	4.5	41	--	4.5
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	0.19	--	0.09	4.7	--	0.18	1	J	0.09	ND	UJ	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	130	--	6	150	--	6	150	--	6	150	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	130	--	6	150	--	6	150	--	6	150	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106244-445			KAFB-106245-460			KAFB-106247-450			KAFB-106S1-447		
						Field Sample ID:	GW244-445-203			GW245-460-203			GW247-450-203			GWS1-447-203		
						Sample Date:	7/8/2020			7/9/2020			7/8/2020			7/10/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):				487.77						471.12		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	140	--	0.15	59	--	0.15	47	--	0.15	210	J	0.15
		Iron, dissolved	1.0	NS	NS	1.0	ND	U	0.1	ND	U	0.1	ND	U	0.1	**7.3**	J	0.1
		Magnesium	NS	NS	NS	NS	22	--	0.075	8.4	--	0.075	7	--	0.075	34	J	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052	**7.2**	J	0.0052
		Potassium	NS	NS	NS	NS	4.4	--	0.38	2.6	--	0.38	2.4	--	0.38	4.6	--	0.38
		Sodium	NS	NS	NS	NS	58	--	0.5	25	--	0.5	25	--	0.5	48	J	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.00076	J	0.0016	0.0011	J	0.0016	ND	U	0.0016	0.0058	J	0.0016
		Lead	0.015	0.015	0.015	0.015	ND	U	0.00025	ND	U	0.00025	ND	U	0.00025	0.00024	J	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	ND	U	2	1.6	J	2	ND	U	2	ND	U	2
		Chloride	250	250	NS	250	130	--	15	52	--	15	10	--	1.5	22	--	1.5
		Sulfate	600	250	NS	250	**320**	--	45	50	--	4.5	32	--	4.5	3.4	J	4.5
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	3.5	--	0.09	1.1	--	0.09	1	--	0.09	ND	U	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	110	--	6	110	--	6	160	--	6	550	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	110	--	6	110	--	6	160	--	6	550	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106S2-451			KAFB-106S3-449			KAFB-106S4-446			KAFB-106S5-446		
						Field Sample ID:	GWS2-451-203			GWS3-449-203			GWS4-446-203			GWS5-446-203		
						Sample Date:	7/10/2020			7/10/2020			7/9/2020			7/10/2020		
						Sample Type:	REG			REG			REG			REG		
						Sample Depth (ft bgs):	478.15			478.91			473.04			470.1		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	160	--	0.15	110	--	0.15	190	--	0.15	72	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	0.075	J	0.1	**3.8**	--	0.1	ND	U	0.1	**1.7**	--	0.1
		Magnesium	NS	NS	NS	NS	26	--	0.075	19	--	0.075	29	--	0.075	11	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	**5.8**	--	0.0052	**2.5**	--	0.0052	ND	U	0.0052	**2.1**	--	0.0052
		Potassium	NS	NS	NS	NS	3.8	--	0.38	3.5	--	0.38	4.9	--	0.38	2.7	--	0.38
		Sodium	NS	NS	NS	NS	43	--	0.5	37	--	0.5	64	--	0.5	28	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.0017	J	0.0016	0.0066	--	0.0016	ND	U	0.0016	0.0032	--	0.0016
		Lead	0.015	0.015	0.015	0.015	0.0006	--	0.00025	0.0004	J	0.00025	ND	U	0.00025	0.00046	J	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	ND	U	2	1.5	J	2	ND	U	20	ND	U	2
		Chloride	250	250	NS	250	96	--	15	44	--	15	180	--	15	21	--	1.5
		Sulfate	600	250	NS	250	8.7	--	4.5	2.9	J	4.5	**330**	--	45	ND	U	4.5
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	ND	U	0.09	ND	U	0.09	6.8	--	0.45	ND	U	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	370	--	6	390	--	6	100	--	6	230	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	370	--	6	390	--	6	100	--	6	230	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

						Well Location ID:	KAFB-106S8-451			KAFB-106S8-451			KAFB-106S9-447		
						Field Sample ID:	GWS8-451-203			GWS8-451-603			GWS9-447-203		
						Sample Date:	7/10/2020			7/10/2020			7/10/2020		
						Sample Type:	REG			Field Duplicate			REG		
						Sample Depth (ft bgs):	478.32			478.32			473.7		
						Reference Elevation Interval (ft AMSL):	4857			4857			4857		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
Metals	Method SW6010C (mg/L)	Calcium	NS	NS	NS	NS	190	--	0.15	190	--	0.15	190	--	0.15
		Iron, dissolved	1.0	NS	NS	1.0	ND	U	0.1	0.29	--	0.1	0.5	--	0.1
		Magnesium	NS	NS	NS	NS	28	--	0.075	27	--	0.075	28	--	0.075
		Manganese, dissolved	0.2	NS	NS	0.2	**4.9**	--	0.0052	**5.1**	--	0.0052	**1.5**	--	0.0052
		Potassium	NS	NS	NS	NS	4.2	--	0.38	4.1	--	0.38	4.4	--	0.38
		Sodium	NS	NS	NS	NS	43	--	0.5	43	--	0.5	42	--	0.5
	Method SW6020A (mg/L)	Arsenic	0.01	0.01	0.00052	0.01	0.0034	--	0.0016	0.0034	--	0.0016	0.0015	J	0.0016
		Lead	0.015	0.015	0.015	0.015	ND	U	0.00025	ND	U	0.00025	0.00014	J	0.00025
Anions	Method E300.0 (mg/L)	Bromide	NS	NS	NS	NS	ND	U	2	ND	U	2	ND	U	20
		Chloride	250	250	NS	250	11	--	1.5	9.2	--	1.5	81	--	15
		Sulfate	600	250	NS	250	5	--	4.5	5.1	--	4.5	**290**	--	45
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[e]	10[e]	NS	10[e]	ND	U	0.09	ND	U	0.09	ND	U	0.09
Alkalinity	Method SM2320B (mg/L)	Alkalinity, bicarbonate (as $CaCO_3$)	NS	NS	NS	NS	460	--	6	440	--	6	280	--	6
		Alkalinity, carbonate (as $CaCO_3$)	NS	NS	NS	NS	ND	U	6	ND	U	6	ND	U	6
		Alkalinity, total (as $CaCO_3$)	NS	NS	NS	NS	460	--	6	440	--	6	280	--	6

Table 3-6
Groundwater Analytical Results for Inorganic Compounds for Groundwater Monitoring Wells, Q3 2020

[a] NMWQCC numeric standards per the NMAC Title 20.6.2.3101A, Standards for Ground Water of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC 2018). For metals, the NMWQCC numeric standard applies to dissolved metals.

[b] EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Part 141, 143 (May 2018).

[c] EPA Region 6 RSL for Tapwater (May 2020) for hazard index = 1.0 for noncarcinogens and a 10-5 cancer risk level for carcinogens.

[d] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC standard or MCL exists for any analyte, then the project screening level will be the EPA RSL.

[e] Based on the geochemical equilibrium of the site groundwater and previous site data analyses, nitrate/nitrite results represent nitrate concentrations.

AFB = Air Force Base
AMSL = above mean sea level
bgs = below ground surface
$CaCO_3$ = calcium carbonate
CFR = Code of Federal Regulations
EPA = U.S. Environmental Protection Agency
ft = foot (feet)
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
mg/L = milligram per liter
ND = not detected
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
NS = not specified
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
Val Qual = validation qualifier
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation:
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
-- = Validation qualifier not assigned.

Table 3-7
Status of Quarterly Baseline Sampling Newly Added Wells and Summary of Q3 2020 Analytical Results

Well Location ID	Reference Elevation Interval (ft AMSL)	Dates Newly Added Wells Sampled	Number of Quarters Sampled	Remaining Quarters to Complete Baseline	Summary of Analytical Results for Samples Collected During Q3 2020
KAFB-106S7-451[a,b]	4857	4/16/2019, 5/9/2019	1	0	EDB and BTEX exceeded their respective MCLs. Dissolved manganese and dissolved iron exceeded their PSLs.
		8/12/2019	2		
		10/31/2019	3		
		1/9/2020	4		
		4/16/2020	5		
		7/10/2020	6		

[a] This well was sampled for dissolved metals, anions, and alkalinity on May 9, 2019.

[b] During sampling in both the fourth quarter 2019 and first quarter 2020, there was a failure in the sleeve around the passive sampler that resulted in insufficient sample volume for the full suite of analytes. Therefore, to achieve four complete sets of baseline analysis, two additional quarters of baseline sampling were conducted.

AMSL = above mean sea level
BTEX = benzene, toluene, ethylbenzene, and total xylenes
EDB = ethylene dibromide (1,2-dibromoethane)
ft = foot (feet)
ID = identification
MCL = maximum contaminant level
PSL = project screening level
Q3 = third quarter

Table 3-8
Historical LNAPL Thickness

Well ID	KAFB-106005	KAFB-106006	KAFB-106008	KAFB-106009	KAFB-106010	KAFB-106014	KAFB-106028	KAFB-106059	KAFB-106076	KAFB-106079	KAFB-106150-484	KAFB-106154-484
REI	4857	4857	4857	4857	4857	4857	4857	4857	4857	4857	4857	4857
Sampling Quarter	LNAPL Thickness (feet)											
Q3 2010	4.03	0.88	2.83	1.01	0.06	0.21	0.15	--	--	--	--	--
Q4 2012	--	--	--	--	--	--	--	0.14	0.8	--	--	--
Q1 2103	--	--	--	--	--	--	--	--	0.04	--	--	--
Q2 2103	0.01	--	--	--	--	--	--	--	--	--	--	--
Q3 2013	--	--	--	--	--	--	--	--	0.38	--	--	--
Q4 2013	0.03	--	--	--	--	--	--	--	0.25	--	--	--
Q1 2014	--	--	--	--	--	--	--	--	--	--	--	--
Q2 2014	--	--	--	--	--	--	--	--	--	--	--	--
Q3 2014	--	--	--	--	--	--	--	--	--	--	--	--
Q1 2015	--	--	--	--	--	--	--	--	--	--	--	--
Q2 2015	--	--	--	--	--	--	--	--	--	--	--	--
Q3 2015	--	--	--	--	--	--	--	--	--	--	--	--
Q1 2016/ Q4 2015	0.10	--	--	--	--	--	--	--	0.02	--	--	--
Q2 2016	0.01	--	0.05	--	--	--	--	--	0.01	--	--	--
Q3 2016	0.01	--	0.04	--	--	--	--	--	0.01	--	--	--
Q4 2016	--	--	0.03	--	--	--	--	--	--	--	--	--
Q1 2017	--	--	0.01	--	--	--	--	--	--	--	--	--
Q2 2017	--	--	--	--	--	--	--	--	--	--	--	--
Q3 2017	--	--	--	--	--	--	--	--	--	--	--	--
Q4 2017	--	--	--	--	--	--	--	--	--	--	0.03	0.03
Q1 2018	--	--	--	--	--	--	--	--	0.01	0.02	0.03	0.02
Q2 2018	--	--	--	--	--	--	--	--	--	0.03	0.06	0.03
Q3 2018	--	--	--	--	--	--	--	--	--	--	0.05	0.02
Q4 2018	--	--	--	--	--	--	--	--	0.01	--	0.11	0.04
Q1 2019	--	--	--	--	--	0.11	--	0.34	0.02	0.18	--	0.11
Q2 2019	--	--	--	--	--	0.10	--	0.21	0.01	0.14	--	--
Q3 2019	--	--	--	--	--	0.06	--	0.21	0.01	0.15	--	0.21
Q4 2019	--	--	--	--	--	--	--	--	0.01	--	0.04	0.16
Q1 2020	--	--	--	--	--	--	--	0.24	0.12	--	0.11	--
Q2 2020	--	--	--	--	--	--	--	0.15	0.01	--	0.38	--
Q3 2020	--	--	--	--	--	--	--	0.01	--	--	0.27	0.02

-- = no LNAPL detected

ID = identification

LNAPL = light non-aqueous phase liquid

Q1 = first quarter

Q2 = second quarter

Q3 = third quarter

Q4 = fourth quarter

REI = reference elevation interval

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD
KAFB-106001[c]	4/16/2020	Q2 2020	**2.4**	--	0.38
	11/1/2019	Q4 2019	**0.76**	--	0.19
	10/30/2018	Q4 2018	**1.2**	--	0.19
KAFB-106002	4/17/2020	Q2 2020	ND	U	0.019
	10/11/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	ND	U	0.019
KAFB-106003	7/15/2020	Q3 2020	ND	U	0.019
	1/17/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
	7/24/2019	Q3 2019	ND	U	0.019
KAFB-106004	7/16/2020	Q3 2020	ND	U	0.02
	5/5/2020	Q2 2020	ND	U	0.019
	1/16/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106005	7/13/2020	Q3 2020	1.9	J	0.39
	4/16/2020	Q2 2020	0.016	J	0.019
	1/8/2020	Q1 2020	0.045	--	0.019
	10/30/2019	Q4 2019	**0.10**	J	0.019
KAFB-106006	4/24/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	4/25/2019	Q2 2019	0.035	--	0.019
KAFB-106007	4/24/2020	Q2 2020	ND	U	0.019
	10/18/2019	Q4 2019	ND	U	0.019
	4/24/2019	Q2 2019	ND	U	0.019
KAFB-106008[c]	4/16/2020	Q2 2020	**0.71**	--	0.095
	11/7/2019	Q4 2019	**4.6**	--	1.9
	10/22/2018	Q4 2018	**20**	--	3.8
KAFB-106009	7/9/2020	Q3 2020	0.019	J	0.019
	4/16/2020	Q2 2020	0.016	J	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
KAFB-106010	4/24/2020	Q2 2020	**0.11**	--	0.019
	11/5/2019	Q4 2019	**0.89**	J	0.38
	4/23/2019	Q2 2019	**0.65**	--	0.19
KAFB-106011	4/17/2020	Q2 2020	ND	U	0.019
	10/14/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	0.013	J	0.019
KAFB-106012R	7/14/2020	Q3 2020	ND	U	0.019
	4/23/2020	Q2 2020	ND	U	0.019
	1/14/2020	Q1 2020	ND	U	0.019
	10/18/2019	Q4 2019	ND	U	0.019
KAFB-106013	7/15/2020	Q3 2020	ND	UJ	0.019
	5/1/2020	Q2 2020	ND	U	0.019
	1/15/2020	Q1 2020	ND	U	0.019
	10/23/2019	Q4 2019	ND	U	0.019
KAFB-106014	4/24/2020	Q2 2020	0.043	--	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	5/1/2019	Q2 2019	**0.1**	--	0.019
KAFB-106015	4/6/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.019
KAFB-106016	4/17/2020	Q2 2020	ND	U	0.019
	10/11/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	ND	U	0.019
KAFB-106017	4/21/2020	Q2 2020	**0.28**	--	0.019
	10/15/2019	Q4 2019	**0.25**	J	0.095
	4/2/2019	Q2 2019	**0.2**	--	0.019
KAFB-106018	5/8/2020	Q2 2020	0.017	J	0.019
	10/15/2019	Q4 2019	ND	U	0.019
	4/4/2019	Q2 2019	0.038	--	0.019
KAFB-106019	4/23/2020	Q2 2020	ND	U	0.019
	10/16/2019	Q4 2019	**0.052**	--	0.019
	5/1/2019	Q2 2019	0.016	J	0.019
KAFB-106020	4/28/2020	Q2 2020	ND	U	0.019
	10/17/2019	Q4 2019	ND	U	0.019
	5/2/2019	Q2 2019	ND	U	0.019
KAFB-106021	4/6/2020	Q2 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
	4/15/2019	Q2 2019	ND	U	0.019
KAFB-106022	4/6/2020	Q2 2020	0.017	J	0.019
	10/24/2019	Q4 2019	ND	U	0.019
	4/15/2019	Q2 2019	0.022	J	0.019
KAFB-106023	4/10/2020	Q2 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106024	4/20/2020	Q2 2020	ND	U	0.019
	10/16/2019	Q4 2019	ND	U	0.019
	4/3/2019	Q2 2019	ND	U	0.019
KAFB-106025	4/8/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**
KAFB-106026[d]	4/10/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	11/12/2015	Q4 2015	0.0214	J	0.0285
KAFB-106027	4/20/2020	Q2 2020	ND	U	0.019
	10/15/2019	Q4 2019	ND	U	0.019
	4/1/2019	Q2 2019	ND	U	0.019
KAFB-106028[e]	4/10/2020	Q2 2020	**2.9**	J	0.38
	4/22/2019	Q2 2019	**0.34**	--	0.095
	10/22/2018	Q4 2018	**13**	--	1.9
KAFB-106029	7/9/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106030	7/9/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106031	7/9/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106032	7/8/2020	Q3 2020	ND	U	0.019
	4/8/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106033	7/8/2020	Q3 2020	ND	U	0.019
	4/8/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106034	7/8/2020	Q3 2020	ND	U	0.019
	4/8/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106035	4/8/2020	Q2 2020	**0.093**	--	0.019
	10/29/2019	Q4 2019	**0.12**	--	0.019
	4/10/2019	Q2 2019	**0.12**	--	0.019
KAFB-106036	4/8/2020	Q2 2020	**0.063**	--	0.019
	10/29/2019	Q4 2019	**0.097**	--	0.019
	4/10/2019	Q2 2019	**0.13**	--	0.019
KAFB-106037	4/8/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	**0.15**	--	0.019
	4/10/2019	Q2 2019	**0.13**	--	0.019
KAFB-106038	4/22/2020	Q2 2020	ND	U	0.019
	10/17/2019	Q4 2019	ND	U	0.019
	4/4/2019	Q2 2019	ND	U	0.019
KAFB-106039	4/22/2020	Q2 2020	ND	U	0.019
	10/17/2019	Q4 2019	ND	U	0.019
	4/22/2019	Q2 2019	ND	U	0.019
KAFB-106040	4/23/2020	Q2 2020	ND	U	0.019
	10/16/2019	Q4 2019	ND	U	0.019
	4/22/2019	Q2 2019	ND	U	0.019
KAFB-106041	7/8/2020	Q3 2020	0.016	J	0.019
	4/9/2020	Q2 2020	**0.054**	--	0.019
	1/9/2020	Q1 2020	0.049	--	0.019
	10/30/2019	Q4 2019	**0.057**	J	0.019
KAFB-106042	4/9/2020	Q2 2020	0.032	--	0.019
	10/30/2019	Q4 2019	**0.057**	J	0.019
	4/8/2019	Q2 2019	0.027	J	0.019
KAFB-106043	4/9/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/8/2019	Q2 2019	ND	U	0.019
KAFB-106044	4/20/2020	Q2 2020	ND	U	0.019
	10/15/2019	Q4 2019	ND	U	0.019
	4/1/2019	Q2 2019	ND	U	0.019
KAFB-106045	4/24/2020	Q2 2020	ND	U	0.019
	10/21/2019	Q4 2019	ND	U	0.019
	4/24/2019	Q2 2019	ND	U	0.019
KAFB-106046	4/22/2020	Q2 2020	ND	U	0.019
	10/14/2019	Q4 2019	ND	U	0.019
	4/3/2019	Q2 2019	ND	U	0.019
KAFB-106047	4/17/2020	Q2 2020	ND	U	0.019
	10/14/2019	Q4 2019	ND	U	0.019
	4/3/2019	Q2 2019	ND	U	0.019
KAFB-106048	4/29/2020	Q2 2020	ND	U	0.019
	10/22/2019	Q4 2019	ND	U	0.019
	4/26/2019	Q2 2019	ND	U	0.019
KAFB-106049	7/8/2020	Q3 2020	ND	U	0.019
	4/9/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD
KAFB-106050	7/8/2020	Q3 2020	ND	U	0.019
	4/9/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
KAFB-106051	7/8/2020	Q3 2020	ND	U	0.019
	4/9/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
KAFB-106052	4/8/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/8/2019	Q2 2019	ND	U	0.019
KAFB-106053	4/8/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/8/2019	Q2 2019	ND	U	0.019
KAFB-106054	4/8/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/8/2019	Q2 2019	ND	U	0.019
KAFB-106055	4/7/2020	Q2 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
	4/15/2019	Q2 2019	0.019	J	0.019
KAFB-106057	4/7/2020	Q2 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
	4/15/2019	Q2 2019	0.01	J	0.019
KAFB-106058	4/9/2020	Q2 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
	4/15/2019	Q2 2019	0.0095	J	0.019
KAFB-106059	5/6/2020	Q2 2020	0.03	--	0.019
	10/21/2019	Q4 2019	**1.7**	J	0.38
	4/26/2019	Q2 2019	**3.1**	--	0.38
KAFB-106060	4/20/2020	Q2 2020	ND	U	0.019
	10/11/2019	Q4 2019	**0.14**	--	0.019
	4/1/2019	Q2 2019	0.049	--	0.019
KAFB-106061	4/27/2020	Q2 2020	ND	U	0.019
	11/5/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	ND	U	0.019
KAFB-106062	4/21/2020	Q2 2020	ND	UJ	0.019
	10/14/2019	Q4 2019	ND	U	0.019
	4/4/2019	Q2 2019	ND	U	0.019
KAFB-106063[f]	5/19/2020	Q2 2020	ND	U	0.019
	10/4/2018	Q4 2018	**3.6**	J	0.38
	4/10/2018	Q2 2018	**3.7**	--	0.95
KAFB-106064[f]	5/19/2020	Q2 2020	ND	U	0.019
	10/4/2018	Q4 2018	**0.25**	--	0.019
	4/10/2018	Q2 2018	**12**	--	1.9
KAFB-106065	4/22/2020	Q2 2020	ND	U	0.019
	10/11/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	ND	U	0.019
KAFB-106066	4/22/2020	Q2 2020	ND	U	0.019
	10/10/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	ND	U	0.019
KAFB-106067	4/21/2020	Q2 2020	ND	UJ	0.019
	10/14/2019	Q4 2019	ND	U	0.019
	4/1/2019	Q2 2019	0.027	J	0.019
KAFB-106068	4/20/2020	Q2 2020	ND	U	0.019
	10/11/2019	Q4 2019	ND	U	0.019
	4/1/2019	Q2 2019	ND	U	0.019
KAFB-106069	4/23/2020	Q2 2020	0.014	J	0.019
	10/16/2019	Q4 2019	ND	U	0.019
	4/30/2019	Q2 2019	0.014	J	0.019
KAFB-106070	4/16/2020	Q2 2020	ND	U	0.019
	11/1/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.026
KAFB-106071	4/16/2020	Q2 2020	ND	U	0.019
	11/1/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.019
KAFB-106072	4/16/2020	Q2 2020	ND	U	0.019
	11/1/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	0.03	--	0.019
KAFB-106073	4/30/2020	Q2 2020	ND	U	0.019
	10/17/2019	Q4 2019	ND	U	0.019
	5/2/2019	Q2 2019	0.015	J	0.019
KAFB-106074	4/30/2020	Q2 2020	ND	U	0.019
	10/22/2019	Q4 2019	ND	U	0.019
	4/25/2019	Q2 2019	ND	U	0.019
KAFB-106075	4/20/2020	Q2 2020	0.023	J	0.019
	10/14/2019	Q4 2019	0.034	--	0.019
	4/3/2019	Q2 2019	0.043	--	0.019
KAFB-106076	4/28/2020	Q2 2020	0.024	J	0.019
	10/16/2019	Q4 2019	0.035	--	0.019
	5/2/2019	Q2 2019	0.047	--	0.019

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**
KAFB-106077	4/27/2020	Q2 2020	ND	U	0.019
	10/18/2019	Q4 2019	ND	U	0.019
	4/23/2019	Q2 2019	ND	U	0.019
KAFB-106078	4/21/2020	Q2 2020	ND	U	0.019
	10/15/2019	Q4 2019	ND	U	0.019
	4/2/2019	Q2 2019	ND	U	0.019
KAFB-106079[c]	4/10/2020	Q2 2020	0.012	J	0.019
	10/23/2019	Q4 2019	0.027	J	0.019
	10/23/2018	Q4 2018	0.011	J	0.019
KAFB-106080	4/23/2020	Q2 2020	ND	U	0.019
	10/16/2019	Q4 2019	ND	U	0.019
	4/3/2019	Q2 2019	ND	U	0.019
KAFB-106081	4/29/2020	Q2 2020	ND	U	0.019
	10/18/2019	Q4 2019	ND	U	0.019
	4/24/2019	Q2 2019	ND	U	0.019
KAFB-106082	4/28/2020	Q2 2020	ND	U	0.019
	10/18/2019	Q4 2019	ND	U	0.019
	4/29/2019	Q2 2019	ND	U	0.019
KAFB-106083	4/28/2020	Q2 2020	0.022	J	0.019
	10/18/2019	Q4 2019	ND	U	0.019
	4/30/2019	Q2 2019	0.026	J	0.019
KAFB-106084	4/28/2020	Q2 2020	ND	U	0.019
	10/22/2019	Q4 2019	ND	U	0.019
	4/29/2019	Q2 2019	ND	U	0.095
KAFB-106085	4/6/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	0.014	J	0.019
	4/10/2019	Q2 2019	0.014	J	0.019
KAFB-106086	4/6/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106087	4/6/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106088	4/9/2020	Q2 2020	0.041	--	0.019
	11/4/2019	Q4 2019	**0.11**	--	0.019
	4/10/2019	Q2 2019	**0.085**	--	0.019
KAFB-106089	4/9/2020	Q2 2020	ND	U	0.036
	11/4/2019	Q4 2019	**0.064**	--	0.019
	4/10/2019	Q2 2019	**0.058**	--	0.019
KAFB-106090	4/9/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106091	4/8/2020	Q2 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106092	4/8/2020	Q2 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.019
KAFB-106093	4/8/2020	Q2 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.019
KAFB-106094	4/21/2020	Q2 2020	ND	UJ	0.019
	10/14/2019	Q4 2019	ND	U	0.019
	4/3/2019	Q2 2019	0.019	J	0.019
KAFB-106095	4/29/2020	Q2 2020	ND	U	0.019
	10/21/2019	Q4 2019	ND	U	0.019
	5/2/2019	Q2 2019	ND	U	0.019
KAFB-106096	5/8/2020	Q2 2020	ND	U	0.019
	10/10/2019	Q4 2019	ND	U	0.019
	4/1/2019	Q2 2019	ND	U	0.019
KAFB-106097	7/16/2020	Q3 2020	ND	U	0.019
	5/1/2020	Q2 2020	ND	U	0.019
	1/15/2020	Q1 2020	ND	U	0.019
	10/23/2019	Q4 2019	ND	U	0.019
KAFB-106098	7/15/2020	Q3 2020	ND	U	0.019
	5/1/2020	Q2 2020	ND	U	0.019
	1/15/2020	Q1 2020	ND	U	0.019
	10/23/2019	Q4 2019	ND	U	0.019
KAFB-106099	7/16/2020	Q3 2020	ND	U	0.019
	5/5/2020	Q2 2020	ND	U	0.019
	1/16/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106100	7/16/2020	Q3 2020	ND	U	0.019
	5/5/2020	Q2 2020	ND	U	0.019
	1/16/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106101	7/15/2020	Q3 2020	ND	U	0.019
	5/4/2020	Q2 2020	ND	U	0.019
	1/17/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**
KAFB-106102	7/15/2020	Q3 2020	ND	U	0.019
	5/4/2020	Q2 2020	ND	U	0.019
	1/17/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106103	4/10/2020	Q2 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106104	4/16/2020	Q2 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106105	4/8/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106106	4/8/2020	Q2 2020	0.022	J	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106107	4/8/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106149-484	7/10/2020	Q3 2020	**11**	--	1.9
	4/16/2020	Q2 2020	**78**	--	19
	1/9/2020	Q1 2020	**40**	--	9.6
	11/1/2019	Q4 2019	**100**	--	19
KAFB-106151-484	7/10/2020	Q3 2020	0.023	J	0.019
	4/16/2020	Q2 2020	**2.6**	--	0.38
	1/9/2020	Q1 2020	**3.4**	--	0.96
	11/1/2019	Q4 2019	**1.4**	--	0.38
KAFB-106152-484	7/10/2020	Q3 2020	0.019	J	0.019
	4/16/2020	Q2 2020	ND	U	0.019
	1/9/2020	Q1 2020	ND	U	0.019
	11/1/2019	Q4 2019	0.043	--	0.019
KAFB-106153-484	7/10/2020	Q3 2020	**30**	--	3.8
	4/16/2020	Q2 2020	**140**	--	19
	1/9/2020	Q1 2020	**460**	--	96
	11/1/2019	Q4 2019	**820**	--	94
KAFB-106201	7/9/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
KAFB-106202	7/9/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
KAFB-106203	7/9/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
KAFB-106204	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/23/2019	Q4 2019	ND	U	0.019
KAFB-106205	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	0.022	J	0.019
	10/23/2019	Q4 2019	ND	U	0.019
KAFB-106206	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/23/2019	Q4 2019	ND	U	0.019
KAFB-106207	7/7/2020	Q3 2020	ND	U	0.019
	4/10/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106208	7/7/2020	Q3 2020	ND	U	0.019
	4/10/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106209	7/7/2020	Q3 2020	ND	U	0.019
	4/10/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106212	4/8/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106213	4/8/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.019
KAFB-106214	4/8/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/16/2019	Q2 2019	ND	U	0.019

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD
KAFB-106215	4/8/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106216	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106217	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106218	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106219	4/7/2020	Q2 2020	ND	U	0.019
	11/5/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106220	4/7/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106221	4/7/2020	Q2 2020	ND	U	0.019
	11/4/2019	Q4 2019	ND	U	0.019
	4/10/2019	Q2 2019	ND	U	0.019
KAFB-106222	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106223	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106224	7/7/2020	Q3 2020	ND	U	0.019
	4/7/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/24/2019	Q4 2019	ND	U	0.019
KAFB-106225	4/6/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	0.018	J	0.019
KAFB-106226	4/6/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106227	4/6/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/9/2019	Q2 2019	ND	U	0.019
KAFB-106229	4/7/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	4/8/2019	Q2 2019	ND	U	0.019
KAFB-106230[g]	7/8/2020	Q3 2020	ND	U	0.019
	4/10/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106231	7/7/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106232	7/7/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106235-438	7/6/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106235-472	7/6/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106235-501	7/6/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106236-436	7/6/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
KAFB-106236-470	7/6/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019

Table 3-9
Historical EDB Concentrations

		Analyte:	EDB (1,2-dibromoethane)		
		EPA MCL[a]:	0.05 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**
KAFB-106236-499	7/6/2020	Q3 2020	ND	U	0.019
	4/6/2020	Q2 2020	ND	U	0.019
	10/29/2019	Q4 2019	ND	U	0.019
	7/29/2019	Q3 2019	ND	U	0.019
KAFB-106240-449	7/8/2020	Q3 2020	ND	U	0.020
	4/9/2020	Q2 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
	7/30/2019	Q3 2019	ND	U	0.019
KAFB-106241-428	7/8/2020	Q3 2020	ND	U	0.019
	4/9/2020	Q2 2020	0.015	J	0.019
	1/8/2020	Q1 2020	0.021	J	0.017
	10/30/2019	Q4 2019	0.026	J	0.019
KAFB-106242-418	7/7/2020	Q3 2020	ND	U	0.020
	4/6/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/28/2019	Q4 2019	ND	U	0.019
KAFB-106243-425	7/9/2020	Q3 2020	0.035	--	0.019
	4/9/2020	Q2 2020	0.02	J	0.019
	1/6/2020	Q1 2020	0.042	--	0.019
	10/30/2019	Q4 2019	**0.054**	J	0.019
KAFB-106244-445	7/8/2020	Q3 2020	ND	U	0.02
	4/9/2020	Q2 2020	ND	U	0.019
	1/7/2020	Q1 2020	ND	U	0.019
	10/30/2019	Q4 2019	ND	U	0.019
KAFB-106245-460	7/9/2020	Q3 2020	ND	U	0.019
	4/9/2020	Q2 2020	ND	U	0.019
	1/8/2020	Q1 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
KAFB-106247-450	7/8/2020	Q3 2020	ND	U	0.019
	4/9/2020	Q2 2020	ND	U	0.019
	1/6/2020	Q1 2020	ND	U	0.019
	10/31/2019	Q4 2019	ND	U	0.019
KAFB-106S1-447	7/10/2020	Q3 2020	**28**	J	3.9
	4/9/2020	Q2 2020	**390**	--	190
	1/9/2020	Q1 2020	**450**	J	95
	10/31/2019	Q4 2019	**380**	--	95
KAFB-106S2-451	7/10/2020	Q3 2020	**150**	--	38
	4/9/2020	Q2 2020	**120**	--	19
	1/6/2020	Q1 2020	**170**	--	38
	10/31/2019	Q4 2019	**280**	--	96
KAFB-106S3-449	7/10/2020	Q3 2020	**75**	--	9.6
	4/10/2020	Q2 2020	**35**	J	7.6
	1/9/2020	Q1 2020	**1.5**	--	0.38
	10/31/2019	Q4 2019	**0.80**	--	0.19
KAFB-106S4-446	7/9/2020	Q3 2020	0.035	--	0.019
	4/9/2020	Q2 2020	ND	U	0.048
	1/6/2020	Q1 2020	0.026	J	0.019
	10/31/2019	Q4 2019	0.048	--	0.019
KAFB-106S5-446	7/10/2020	Q3 2020	**3.1**	--	0.39
	4/16/2020	Q2 2020	**11**	--	1.9
	1/9/2020	Q1 2020	**13**	--	3.8
	10/31/2019	Q4 2019	**16**	--	1.9
KAFB-106S7-451	7/10/2020	Q3 2020	**36**	--	3.8
	4/16/2020	Q2 2020	**39**	--	7.5
	1/9/2020	Q1 2020	**2.0**	--	0.38
	10/31/2019	Q4 2019	**2.6**	--	0.38
KAFB-106S8-451	7/10/2020	Q3 2020	**310**	--	38
	4/10/2020	Q2 2020	**400**	J	76
	1/6/2020	Q1 2020	**34**	--	9.4
	10/31/2019	Q4 2019	**170**	--	38
KAFB-106S9-447	7/10/2020	Q3 2020	**0.21**	--	0.019
	4/16/2020	Q2 2020	**35**	--	7.6
	1/9/2020	Q1 2020	**130**	--	38
	11/1/2019	Q4 2019	**58**	--	9.5
KAFB-3411	4/24/2020	Q2 2020	ND	U	0.019
	10/17/2019	Q4 2019	ND	U	0.019
	4/23/2019	Q2 2019	ND	U	0.019

Table 3-9
Historical EDB Concentrations

[a] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC standard or MCL exists for any analyte, then the project screening level will be the EPA RSL. For EDB, the EPA MCL and the NMWQCC numeric standard are both 0.05 µg/L.

[b] Data presented includes results from the current quarter where applicable along with the three most recent historical results. The sampling plan is provided in Table 3-1.

[c] This well was not sampled in Q2 2019 due to suspected biofouling in the well.

[d] This well was not sampled between Q4 2015 and Q4 2019 due to security issues.

[e] This well was not sampled in Q4 2019 due to suspected biofouling in the well.

[f] This well was not sampled in 2019 due to the presence of dedicated downhole equipment related to the EDB *in situ* biodegradation pilot test. Monitoring was resumed in 2020, and results will be available in the next report.

[g] This well was not sampled between Q2 2016 and Q4 2019 due to security issues.

µg/L = microgram per liter
AFB = Air Force Base
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
ND = not detected
NMWQCC = New Mexico Water Quality Control Commission
Q1 = first quarter
Q2 = second quarter
Q3 = third quarter
Q4 = fourth quarter
RSL = regional screening level
Val Qual = validation qualifier
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
-- = Validation qualifier not assigned.

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106001	11/1/2019	Q4 2019	4	--	0.5	ND	U	0.8	11	--	0.5	2	J	2
	10/30/2018	Q4 2018	**6**	--	0.5	0.8	J	0.8	34	--	0.5	6	--	2
	10/31/2017	Q4 2017	1	--	1	ND	U	1	12	--	1	4	--	1
KAFB-106002	10/11/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/17/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/25/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106003	7/15/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/30/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/17/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	0.3	J	0.5	ND	U	2
KAFB-106004	7/16/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/5/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/16/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106005	7/13/2020	Q3 2020	**1,700**	--	10	220	--	1.6	**1,800**	--	10	**840**	--	4
	4/16/2020	Q2 2020	**12**	J	0.5	110	--	0.8	2	--	0.5	160	--	2
	1/8/2020	Q1 2020	**21**	--	0.5	100	--	0.8	4	--	0.5	160	--	2
	10/30/2019	Q4 2019	**30**	--	0.5	83	--	0.8	2	--	0.5	170	--	2
KAFB-106006	4/24/2020	Q2 2020	**11**	--	0.5	2	--	0.8	0.3	J	0.5	5	J	2
	11/4/2019	Q4 2019	3	--	0.5	1	--	0.8	3	--	0.5	4	J	2
	4/25/2019	Q2 2019	**22**	--	0.5	0.8	J	0.8	27	--	0.5	5	--	2
KAFB-106007	10/18/2019	Q4 2019	ND	U	0.5	ND	U	0.8	4	--	0.5	ND	U	2
	10/25/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.5	J	0.5	ND	U	2
	10/26/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106008	4/16/2020	Q2 2020	**8,900**	--	100	380	--	16	**4,000**	--	10	**1,000**	--	40
	11/7/2019	Q4 2019	**3,400**	--	10	230	--	2	950	--	10	480	--	4
	10/22/2018	Q4 2018	**5,800**	--	50	180	J	8	**2,700**	--	5	540	--	20
KAFB-106009	7/9/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	U	0.50	ND	U	2.0
	4/16/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/8/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106010	4/24/2020	Q2 2020	**600**	--	3	150	--	4	160	--	3	120	--	10
	11/5/2019	Q4 2019	**280**	--	5	190	--	0.8	180	--	0.5	150	--	2
	4/23/2019	Q2 2019	**280**	--	0.5	130	--	0.8	28	--	0.5	40	--	2
KAFB-106011	4/17/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/14/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/2/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106012R	7/14/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	--	0.50	ND	U	2.0
	4/23/2020	Q2 2020	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	1/14/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/18/2019	Q4 2019	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
KAFB-106013	7/15/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/1/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/15/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/23/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106014	4/24/2020	Q2 2020	**86**	--	0.5	8	--	0.8	76	--	0.5	16	--	2
	11/4/2019	Q4 2019	**15**	--	0.5	20	--	0.8	2	--	0.5	20	--	2
	5/1/2019	Q2 2019	**53**	--	0.5	67	--	0.8	460	--	5	190	--	2
KAFB-106015	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106016	10/11/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/18/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/26/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106017	4/21/2020	Q2 2020	0.5	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/15/2019	Q4 2019	0.8	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/2/2019	Q2 2019	0.6	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106018	5/8/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/15/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/4/2019	Q2 2019	0.2	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106019	10/16/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/29/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/12/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106020	10/17/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/6/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/9/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106021	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106022	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	0.2	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106023	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106024	10/16/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/17/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/26/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106025	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106026[c]	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/12/2015	Q4 2015	ND	U	1	ND	U	1	ND	U	1	ND	U	3
	8/17/2015	Q3 2015	ND	U	1	ND	U	1	ND	U	1	ND	U	3
KAFB-106027	10/15/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/16/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/12/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106028	4/10/2020	Q2 2020	**1,100**	--	5	190	--	0.8	180	--	0.5	42	--	2
	4/22/2019	Q2 2019	**220**	--	0.5	130	--	0.8	77	--	0.5	38	--	2
	10/22/2018	Q4 2018	**6,800**	--	100	**1,400**	--	16	**15,000**	--	100	**3,000**	--	40

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106029	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106030	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106031	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106032	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106033	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106034	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106035	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106036	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106037	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106038	4/22/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/17/2019	Q4 2019	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	4/4/2019	Q2 2019	ND	U	0.5	ND	U	0.8	63	--	0.5	ND	U	2
KAFB-106039	10/17/2019	Q4 2019	ND	U	0.5	ND	U	0.8	4	--	0.5	ND	U	2
	11/7/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.5	J	0.5	ND	U	2
	10/9/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106040	10/16/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/7/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.3	J	0.5	ND	U	2
	10/25/2017	Q4 2017	ND	U	1	ND	U	1	0.5	J	1	ND	U	1
KAFB-106041	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/16/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106042	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
KAFB-106043	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106044	10/15/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/16/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/12/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106045	10/21/2019	Q4 2019	ND	U	0.5	ND	U	0.8	3	--	0.5	ND	U	2
	10/25/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.3	J	0.5	ND	U	2
	10/30/2017	Q4 2017	ND	U	1	ND	U	1	0.7	J	1	ND	U	1
KAFB-106046	10/14/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/18/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/1/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106047	10/14/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/17/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/1/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106048	10/22/2019	Q4 2019	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	11/13/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.4	J	0.5	ND	U	2
	11/1/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106049	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106050	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106051	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106052	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106053	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106054	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106055	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106057	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/9/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106058	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106059	5/6/2020	Q2 2020	**2,300**	--	13	580	--	20	**1,600**	--	13	**1,800**	--	50
	10/21/2019	Q4 2019	**13,000**	--	50	640	--	8	**12,000**	--	50	**2,000**	--	20
	4/26/2019	Q2 2019	**12,000**	--	50	**900**	--	8	**15,000**	--	50	**3,100**	--	20
KAFB-106060	4/20/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/11/2019	Q4 2019	0.2	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/1/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106061	4/27/2020	Q2 2020	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	11/5/2019	Q4 2019	ND	U	0.5	ND	U	0.8	4	--	0.5	ND	U	2
	4/2/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106062	4/21/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/14/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/4/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106063[d]	5/19/2020	Q2 2020	**5,700**	--	50	**1,700**	--	8	**18,000**	--	50	**5,100**	--	20
	10/4/2018	Q4 2018	**6,400**	--	50	**2,000**	--	8	**20,000**	--	50	**5,700**	--	20
	4/10/2018	Q2 2018	**2,000**	--	10	**710**	--	10	**3,600**	--	100	**1,200**	--	10
KAFB-106064[d]	5/19/2020	Q2 2020	**3,600**	--	25	**1,500**	--	40	380	--	3	**4,700**	--	100
	10/4/2018	Q4 2018	**3,600**	--	50	**1,200**	--	8	**12,000**	--	50	**3,800**	--	20
	4/10/2018	Q2 2018	**3,800**	--	100	**2,100**	--	100	**15,000**	--	100	**5,900**	--	100
KAFB-106065	4/22/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/11/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/2/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106066	4/22/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/10/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/2/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106067	4/21/2020	Q2 2020	1	--	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/14/2019	Q4 2019	1	--	0.5	0.7	J	0.8	ND	U	0.5	ND	U	2
	4/1/2019	Q2 2019	1	--	0.5	2	--	0.8	ND	U	0.5	ND	U	2
KAFB-106068	4/20/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/11/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/1/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106069	4/23/2020	Q2 2020	0.2	J	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	10/16/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/30/2019	Q2 2019	ND	U	0.5	ND	U	0.8	0.2	J	0.5	ND	U	2
KAFB-106070	11/1/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106071	11/1/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106072	11/1/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/5/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106073	10/17/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/6/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/10/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106074	10/22/2019	Q4 2019	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	11/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.3	J	0.5	ND	U	2
	10/10/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106075	10/14/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/23/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/12/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106076	4/28/2020	Q2 2020	0.6	J	0.5	7	--	0.8	2	--	0.5	12	--	2
	10/16/2019	Q4 2019	1	--	0.5	37	--	0.8	ND	U	0.5	100	--	2
	5/2/2019	Q2 2019	4	--	0.5	40	--	0.8	41	--	0.5	100	--	2
KAFB-106077	4/27/2020	Q2 2020	ND	U	0.5	ND	U	0.8	3	--	0.5	ND	U	2
	10/18/2019	Q4 2019	ND	U	0.5	ND	U	0.8	2	--	0.5	ND	U	2
	4/23/2019	Q2 2019	ND	U	0.5	ND	U	0.8	0.5	J	0.5	ND	U	2
KAFB-106078	4/21/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/15/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/2/2019	Q2 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106079	4/10/2020	Q2 2020	1	--	0.5	0.5	J	0.8	0.3	J	0.5	ND	U	2
	10/23/2019	Q4 2019	**140**	--	0.5	34	--	0.8	66	--	0.5	79	--	2
	10/23/2018	Q4 2018	**1,800**	--	5	200	--	0.8	51	--	0.5	380	--	2
KAFB-106080	4/23/2020	Q2 2020	**8**	--	0.5	3	--	0.8	ND	U	0.5	ND	U	2
	10/16/2019	Q4 2019	**170**	--	0.5	9	--	0.8	ND	U	0.5	4	J	2
	4/3/2019	Q2 2019	**8**	--	0.5	5	--	0.8	0.3	J	0.5	ND	U	2
KAFB-106081	4/29/2020	Q2 2020	ND	U	0.5	ND	U	0.8	0.7	J	0.5	ND	U	2
	10/18/2019	Q4 2019	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	4/24/2019	Q2 2019	ND	U	0.5	ND	U	0.8	3	--	0.5	ND	U	2
KAFB-106082	10/18/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/31/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.4	J	0.5	ND	U	2
	10/10/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106083	10/18/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/31/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.6	J	0.5	ND	U	2
	10/10/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106084	10/22/2019	Q4 2019	ND	U	0.5	ND	U	0.8	2	--	0.5	ND	U	2
	10/31/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.5	J	0.5	ND	U	2
	10/10/2017	Q4 2017	ND	U	1	ND	U	1	0.6	J	1	ND	U	1
KAFB-106085	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106086	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106087	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106088	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	0.2	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106089	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106090	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106091	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106092	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106093	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106094	10/14/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/16/2018	Q4 2018	0.3	J	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/11/2017	Q4 2017	1	--	1	0.7	J	1	ND	U	1	ND	U	1
KAFB-106095	10/21/2019	Q4 2019	ND	U	0.5	ND	U	0.8	2	--	0.5	ND	U	2
	11/13/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/11/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106096	10/10/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/16/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/11/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106097	7/16/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/1/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/15/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/23/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106098	7/15/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/1/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/15/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/23/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106099	7/16/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/5/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/16/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106100	7/16/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/5/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/16/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106101	7/15/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/4/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/17/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106102	7/15/2020	Q3 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	5/4/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/17/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106103	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106104	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106105	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106106	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106107	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106149-484	4/16/2020	Q2 2020	**1,900**	--	25	270	--	4	**3,300**	--	25	**1,200**	--	10
	11/1/2019	Q4 2019	**8,200**	--	50	560	--	8	**10,000**	--	50	**2,300**	--	20
	4/16/2019	Q2 2019	**26,000**	--	250	**1,600**	--	400	**33,000**	--	250	**6,000**	--	1,000
KAFB-106151-484	4/16/2020	Q2 2020	**2,100**	--	25	690	--	4	**1,700**	--	25	**890**	--	10
	11/1/2019	Q4 2019	**1,100**	--	10	540	--	2	20	--	1	230	--	4
	4/18/2019	Q2 2019	**1,900**	--	10	600	--	16	70	--	1	350	--	4
KAFB-106152-484	4/16/2020	Q2 2020	**540**	--	5	310	--	8	26	--	0.5	320	--	20
	11/1/2019	Q4 2019	**1,500**	--	3	330	--	4	850	--	3	360	--	10
	4/18/2019	Q2 2019	**430**	--	5	300	--	8	12	--	0.5	290	--	20
KAFB-106153-484	4/16/2020	Q2 2020	**8,300**	--	100	380	--	16	**7,800**	--	100	**1,700**	--	40
	11/1/2019	Q4 2019	**9,000**	--	100	400	--	16	**7,100**	--	100	**1,800**	--	40
	4/18/2019	Q2 2019	**9,200**	--	100	440	--	160	**9,100**	--	100	**1,800**	--	400

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
KAFB-106201	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106202	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/18/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106203	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/18/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106204	10/23/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106205	10/23/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106206	10/23/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106207	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106208	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106209	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106212	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106213	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106214	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106215	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106216	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
KAFB-106217	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106218	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106219	11/5/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106220	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106221	11/4/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/4/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106222	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106223	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106224	10/24/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106225	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106226	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	0.9	J	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106227	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/3/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106229[e]	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	11/20/2015	Q4 2015	0.376	J	1	ND	U	1	ND	U	1	ND	U	3
KAFB-106230[f]	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	4/7/2016	Q2 2016	ND	U	1	ND	U	1	ND	U	1	ND	U	1
	11/18/2015	Q4 2015	ND	U	1	ND	U	1	ND	U	1	ND	U	3
KAFB-106231	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	Sample Date	Sampling Quarter[b]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
KAFB-106232	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/6/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106235-438	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106235-472	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106235-501	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106236-436	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106236-470	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106236-499	10/29/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/1/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1
KAFB-106240-449	7/8/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	U	0.50	ND	U	2.0
	4/9/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/7/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106241-428[e]	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106242-418[e]	10/28/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/8/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106243-425	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/2/2018	Q4 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	9/4/2018	Q3 2018	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106244-445	7/8/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	U	0.50	ND	U	2.0
	4/9/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/7/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/30/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106245-460	7/9/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	U	0.50	ND	U	2
	4/9/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2.0
	1/8/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2

Table 3-10
Historical BTEX Concentrations

		Analyte:	Benzene			Ethylbenzene			Toluene			Xylenes, Total		
		Project Screening Level[a]:	5 µg/L			700 µg/L			1,000 µg/L			620 µg/L		
Well Location ID	**Sample Date**	**Sampling Quarter[b]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
KAFB-106247-450	7/8/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	U	0.50	ND	U	2.0
	4/9/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/6/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106S1-447	7/10/2020	Q3 2020	**5,000**	--	50	500	J	8	**6,300**	--	50	**2,800**	J	20
	4/9/2020	Q2 2020	**7,900**	--	50	**710**	--	8	**9,300**	--	50	**3,300**	--	20
	1/9/2020	Q1 2020	**7,800**	--	50	620	--	8	**10,000**	--	50	**2,600**	--	20
	10/31/2019	Q4 2019	**7,000**	--	100	610	--	16	**8,800**	--	100	**2,400**	--	40
KAFB-106S2-451	7/10/2020	Q3 2020	**1,100**	--	5	130	--	8	320	--	5	**1,200**	--	20
	4/9/2020	Q2 2020	**4,900**	--	25	420	--	4	**2,500**	--	25	**2,700**	--	10
	1/6/2020	Q1 2020	**9,800**	--	50	**880**	--	8	**12,000**	--	50	**4,600**	--	20
	10/31/2019	Q4 2019	**8,300**	--	100	560	--	16	**8,700**	--	100	**3,600**	--	40
KAFB-106S3-449	7/10/2020	Q3 2020	**200**	--	5	24	--	8	5	J	5	450	--	20
	4/10/2020	Q2 2020	**3,800**	--	25	**720**	--	4	**1,300**	--	3	**2,200**	--	10
	1/9/2020	Q1 2020	**5,500**	--	25	**1,400**	--	4	**4,900**	--	25	**4,200**	--	10
	10/31/2019	Q4 2019	**4,800**	--	50	**930**	--	8	**3,600**	--	50	**2,800**	--	20
KAFB-106S4-446	7/9/2020	Q3 2020	ND	U	0.50	ND	U	0.80	ND	U	0.50	ND	U	2.0
	4/9/2020	Q2 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	1/6/2020	Q1 2020	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
	10/31/2019	Q4 2019	ND	U	0.5	ND	U	0.8	ND	U	0.5	ND	U	2
KAFB-106S5-446	7/10/2020	Q3 2020	**990**	--	10	**1,300**	--	16	**3,400**	--	10	**2,400**	--	40
	4/16/2020	Q2 2020	**1,900**	--	5	**1,500**	--	8	**5,200**	--	50	**2,900**	--	20
	1/9/2020	Q1 2020	**1,500**	--	10	**1,600**	--	16	**4,900**	--	10	**3,100**	--	40
	10/31/2019	Q4 2019	**1,300**	--	3	**1,700**	--	40	**3,400**	--	25	**2,500**	--	10
KAFB-106S7-451	7/10/2020	Q3 2020	**520**	--	5	**1,000**	--	8	**1,700**	--	5	**3,300**	--	20
	4/16/2020	Q2 2020	**1,200**	--	10	640	--	16	**1,700**	--	10	**2,200**	--	40
	1/9/2020	Q1 2020	**6,700**	--	50	**1,200**	--	8	**7,700**	--	50	**4,000**	--	20
	10/31/2019	Q4 2019	**5,900**	--	50	**1,200**	--	8	**7,800**	--	50	**4,000**	--	20
KAFB-106S8-451	7/10/2020	Q3 2020	**5,000**	--	50	150	--	80	**3,300**	--	50	**2,000**	--	200
	4/10/2020	Q2 2020	**4,400**	--	25	210	--	4	**6,400**	--	25	**2,100**	--	10
	1/6/2020	Q1 2020	**200**	--	0.5	27	--	0.8	470	--	5	160	--	2
	10/31/2019	Q4 2019	**1,800**	--	5	160	--	8	**5,600**	--	50	**1,100**	--	20
KAFB-106S9-447	7/10/2020	Q3 2020	**4,200**	--	50	620	--	8	**1,700**	--	5	**1,300**	--	20
	4/16/2020	Q2 2020	**9,900**	--	100	**1,100**	--	16	**12,000**	--	100	**3,400**	--	40
	1/9/2020	Q1 2020	**7,300**	--	50	**970**	--	8	**11,000**	--	50	**2,700**	--	20
	11/1/2019	Q4 2019	**7,300**	--	50	**1,100**	--	8	**6,900**	--	50	**1,900**	--	20
KAFB-3411	10/17/2019	Q4 2019	ND	U	0.5	ND	U	0.8	1	--	0.5	ND	U	2
	10/22/2018	Q4 2018	ND	U	0.5	ND	U	0.8	0.5	J	0.5	ND	U	2
	10/30/2017	Q4 2017	ND	U	1	ND	U	1	ND	U	1	ND	U	1

Table 3-10
Historical BTEX Concentrations

[a] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC standard or MCL exists for any analyte, then the project screening level will be the EPA Tapwater RSL. For benzene, ethylbenzene, and toluene, the project screening level is the EPA MCL. For total xylenes, the project screening level is the NMWQCC numeric standard.

[b] Data presented include results from the current quarter where applicable along with the three most recent historical results. The sampling plan is provided in Table 3-1.

[c] This well was not sampled between Q4 2015 and Q4 2019 due to security issues.

[d] This well was not sampled in 2019 due to the presence of dedicated downhole equipment related to the EDB *in situ* biodegradation pilot test. Monitoring was resumed in 2020, and results will be available in the next report.

[e] This well has not been sampled three times for these analytes, all historical data from this well is presented here.

[f] This well was not sampled between Q2 2016 and Q4 2019 due to security issues.

µg/L = microgram per liter
AFB = Air Force Base
BTEX = benzene, toluene, ethylbenzene, and total xylenes
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
ND = not detected
NMWQCC = New Mexico Water Quality Control Commission
Q1 = first quarter
Q2 = second quarter
Q3 = third quarter
Q4 = fourth quarter
RSL = regional screening level
Val Qual = validation qualifier
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
-- = Validation qualifier not assigned.

Table 4-1
Drinking Water Supply Well Analytical Results, Q3 2020

		Location ID:		KAFB-003			KAFB-003			KAFB-003			KAFB-015			KAFB-015			KAFB-015		
		Field Sample ID:		GWK003-2031			GWK003-2032			GWK003-2033			GWK015-2031			GWK015-2032			GWK015-2033		
		Sample Date:		7/7/2020			8/4/2020			9/1/2020			7/7/2020			8/4/2020			9/1/2020		
		Sample Type:		REG			REG			REG			REG			REG			REG		
Parameter	**Analytical Method**	**Analyte**	**EPA MCL[a]**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOD**
EDB	Method E504.1 (µg/L)	1,2-dibromoethane	0.05	ND	U	0.018	ND	U	0.018	ND	U	0.018	ND	U	0.018	ND	U	0.018	ND	U	0.018
BTEX	Method E524.2 (µg/L)	Benzene	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Toluene	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, Total	10,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
Field Parameters		Temperature (°C)	NS	21.9			21.2			21.3			27.0			27.6			26.2		
		Specific Conductance (µS/cm)	NS	611			387.5			444.2			703			432.3			507		
		pH (S.U.)	NS	7.86			7.72			7.75			7.86			7.86			7.86		
		ORP (mV)	NS	257.5			609.7			201.0			257.2			481.3			199.4		
		DO (mg/L)	NS	3.91			4.10			3.37			0.45			0.82			0.50		
		Turbidity (NTU)	NS	0.64			0.58			0.24			0.32			0.41			0.24		

Table 4-1
Drinking Water Supply Well Analytical Results, Q3 2020

			Location ID:	KAFB-016			KAFB-016			KAFB-016			ST106-VA2			ST106-VA2			ST106-VA2		
			Field Sample ID:	GWK016-2031			GWK016-2032			GWK016-2033			GWVA2-2031			GWVA2-6031			GWVA2-2032		
			Sample Date:	7/7/2020			8/4/2020			9/1/2020			7/7/2020			7/7/2020			8/4/2020		
			Sample Type:	REG			REG			REG			REG			Field Duplicate			REG		
Parameter	**Analytical Method**	**Analyte**	**EPA MCL[a]**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOQ**	**Result**	**Val Qual**	**LOQ**
EDB	Method E504.1 (µg/L)	1,2-dibromoethane	0.05	ND	U	0.018	ND	U	0.018	ND	U	0.018	ND	U	0.018	ND	U	0.018	ND	U	0.018
BTEX	Method E524.2 (µg/L)	Benzene	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Toluene	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, Total	10,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
Field Parameters		Temperature (°C)	NS	26.1			26.6			25.0			22.5			22.5			22.9		
		Specific Conductance (µS/cm)	NS	804			579			514			631			631			360.5		
		pH (S.U.)	NS	6.8			6.08			7.63			7.84			7.84			7.80		
		ORP (mV)	NS	NR[b]			653.2			224.7			267.6			267.6			451.1		
		DO (mg/L)	NS	0.45			0.53			1.11			2.06			2.06			1.33		
		Turbidity (NTU)	NS	0.37			0.67			0.19			0.72			0.72			0.23		

Table 4-1
Drinking Water Supply Well Analytical Results, Q3 2020

			Location ID:	ST106-VA2			ST106-VA2		
			Field Sample ID:	GWVA2-2033			GWVA2-6033		
			Sample Date:	9/1/2020			9/1/2020		
			Sample Type:	REG			Field Duplicate		
Parameter	**Analytical Method**	**Analyte**	**EPA MCL[a]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method E504.1 (µg/L)	1,2-dibromoethane	0.05	ND	U	0.018	ND	U	0.018
BTEX	Method E524.2 (µg/L)	Benzene	5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	ND	U	0.5	ND	U	0.5
		Toluene	1,000	ND	U	0.5	ND	U	0.5
		Xylenes, Total	10,000	ND	U	0.5	ND	U	0.5
Field Parameters		Temperature (°C)	NS	21.1			21.1		
		Specific Conductance (µS/cm)	NS	426.9			426.9		
		pH (S.U.)	NS	7.69			7.69		
		ORP (mV)	NS	243.6			243.6		
		DO (mg/L)	NS	1.55			1.55		
		Turbidity (NTU)	NS	0.24			0.24		

Table 4-1
Drinking Water Supply Well Analytical Results, Q3 2020

[a] EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Parts 141 and 143 (May 2018).
[b] The ORP value recorded on the field form for KAFB-016 in July was -17.9 mV. This reading was most likely instrument error, as the ORP value at this location is typically comparable to values read at KAFB-015. Therefore, it is not reported in this table.
— = Compound not analyzed for.
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
ºC = degree Celsius
AFB = Air Force Base
BTEX = benzene, toluene, ethylbenzene, and total xylenes
CFR = Code of Federal Regulations
DO = dissolved oxygen
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ID = identification
LOQ = limit of quantitation
MCL = maximum contaminant level
mg/L = milligram per liter
mV = millivolt
ND = nondetect
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
NS = not specified
NTU = nephelometric turbidity unit
ORP = oxidation reduction potential
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
S.U. = standard units
Val Qual = validation qualifier
Val Quals based on independent data validation:
J = Qualifier denotes the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOQ.

Table 5-1
DP-1839 Discharge Permit Terms and Conditions, Operations and Maintenance Plan Cross References

Condition No.	Terms and Conditions	Reference Location in Quarterly Report
15	The Permittee shall ensure the treated effluent conveyance system, i.e., piping, between the GWTS and the UIC well(s) does not leak and shall report any such leakage to the NMED GWQB in accordance with 20.6.2.1203(A) NMAC and copy the NMED HWB.	5.3.4 Effluent Conveyance Line Integrity
	Within 1 year of the effective date of this Discharge Permit, the Permittee shall demonstrate the structural integrity of the treated effluent conveyance system between the GWTS and KAFB-7.	5.3.4 Effluent Conveyance Line Integrity
	Prior to testing, the Permittee shall propose for NMED approval the test method to be used.	5.3.4 Effluent Conveyance Line Integrity
	The results of the mechanical integrity testing shall be submitted to NMED within 60 days of test completion.	5.3.4 Effluent Conveyance Line Integrity
	The Permittee shall integrity test the treated effluent conveyance system between GWTS and the UIC well(s) prior to submitting a permit renewal application. [20.6.2.3106(C) NMAC, 20.6.2.3107(A) NMAC]	5.3.4 Effluent Conveyance Line Integrity
17	The Permittee shall conduct the monitoring, operations, and reporting listed below.	5.1 Groundwater Treatment System Operation
	Unless otherwise specified, all periodic monitoring results or general information obtained shall be reported in the forthcoming quarterly report. [20.6.2.3107 NMAC]	5.1 Groundwater Treatment System Operation
18	Unless otherwise approved by NMED, the Permittee shall conduct sampling in accordance with standard industry practice.	5.2 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal
	Sampling in accordance with the most current version of the GWTS Sampling and Analysis Plan (Appendix L of the O&M Plan), which includes sampling locations, procedures, field measurements, quality control samples, handling and custody, analytical methods, quality control, analytical validation, and reporting requirements, satisfies this Condition. [20.6.2.3107(B) NMAC]	5.2 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal
19	The Permittee shall submit quarterly and annual reports to NMED pursuant to the most recent NMED HWB approved Work Plans.	5.2 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal
	The Permittee shall identify the portions of these reports pertaining to this Discharge Permit with a table in the reports that identifies those portions.	Table 5-1 DP-1839 Discharge Permit Terms and Conditions, Operations and Maintenance Plan Cross References
	Quarterly reports shall be submitted as specified below unless otherwise authorized by NMED: • January 1st through March 31st - due by June 30th • April 1st through June 30th - due by September 30th • July 1st through September 30th - due by December 31st • October 1st through December 31st - due by March 31st	Noted
	Annual reporting requirements for the previous year, i.e., January 1 through December 31, shall be reported in the March 31 quarterly report. [20.6.2.3107(A) NMAC]	Noted
20	The Permittee shall monitor the concentration of all COCs listed on Table 2 in GWTS treated effluent. Associated sampling and analysis shall be performed monthly at a minimum.	5.2 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal Table 5-6 Monthly GWTS Performance Analytical Results for Train 1, Q3 2020 Table 5-7 Monthly GWTS Performance Analytical Results for Train 2, Q3 2020
	When groundwater from a new extraction well is first introduced to the GWTS, COC monitoring of the GWTS treated effluent shall occur daily for the first week of treatment, weekly for the first month of treatment, and monthly thereafter.	Not applicable in Q3 2020
	If alterations to, or conditions at, the GWTS result in a potential impact to effluent quality, the Permittee will repeat this sampling sequence as directed by NMED.	No effluent quality impacts Q3 2020
20	A representative sample of GWTS influent and effluent shall be analyzed annually for the constituents identified in Table 3.	Performed in Q3 2020. Table 5-8 GWTS Annual Analytical Result Q3 2020
	A representative sample of GWTS influent and effluent shall be analyzed every 5 years for the constituents identified in Table 4	Performed in Q3 2017; last reported in Q3 2017; Not applicable to Q3 2020
	The first analysis of the 5-year constituent list shall occur in July 2017. Any newly identified constituents detected during the 5-year sampling events will be added to the annual sampling constituent list in Table 3.	Performed in Q3 2017; last reported in Q3 2017; Not applicable to Q3 2020
	All analysis of GWTS influent and effluent shall utilize analytical methods with detection limits that are sufficiently low to allow comparison to the standards included in the above referenced state and federal regulations.	5.2 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal Table 5-6 Monthly GWTS Performance Analytical Results for Train 1, Q3 2020 Table 5-7 Monthly GWTS Performance Analytical Results for Train 2, Q3 2020
	All sampling, analysis, and reporting shall comply with the most recent approved Work Plans. [20.6.2.3107(A) NMAC and 20.6.2.3107(B) NMAC]	5.2 Groundwater Treatment System Performance Monitoring and Ethylene Dibromide Removal

Table 5-1
DP-1839 Discharge Permit Terms and Conditions, Operations and Maintenance Plan Cross References

Condition No.	Terms and Conditions	Reference Location in Quarterly Report
21	The Permittee shall report the volume of treated GWTS effluent discharged to each UIC well each quarter. This report shall include the following:	See Below
	a. Monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each UIC well	Table 5-4 Groundwater Treatment System Injection Well Performance, Q3 2020
	b. The totalized monthly volume of treated effluent transferred to all UIC wells	Table 5-2 Quantities of Groundwater Treated and Discharged, Q3 2020
	c. Monthly average, maximum, and minimum head values of injection water for each UIC well.	Table 5-4 Groundwater Treatment System Injection Well Performance, Q3 2020
	The Permittee shall monitor the GWTS effluent volume utilizing an effluent flow meter installed on the effluent pump skid after the GAC units. Each UIC well shall have a dedicated flowmeter. Flowmeters shall be inspected and calibrated in accordance with the associated manufacturer's recommendations. [20.6.2.3107 NMAC]	Table 5-4 Groundwater Treatment System Injection Well Performance, Q3 2020 Table 5-9 GWTS Routine Maintenance (Monthly Flowmeter Inspection and Annual Calibration Verification)
22	The Permittee shall include the following results and general information in quarterly reports to NMED:	See Below
	a. Any mechanical integrity (tests) conducted on either the GWTS or a UIC well	5.3.3 Non-Routine Maintenance Table 5-10 GWTS Non-Routine Maintenance Items, Q3 2020
	b. Any replacement of GAC media and the associated data that initiated the decision to replace the media	5.3.3 Non-Routine Maintenance Table 5-10 GWTS Non-Routine Maintenance Items, Q3 2020
	c. Any UIC well rehabilitation conducted	5.3.1 Routine Maintenance Activities Table 5-9 GWTS Routine Maintenance Items, Q3 2020 5.3.3 Non-Routine Maintenance Table 5-10 GWTS Non-Routine Maintenance Items, Q3 2020
	d. Any malfunction, repair, or replacement of a flowmeter	5.3.3 Non-Routine Maintenance Table 5-10 GWTS Non-Routine Maintenance Items, Q3 2020
	e. Any additional operational changes with the potential to affect the discharge. [20.6.2.3107 NMAC]	5.3.3 Non-Routine Maintenance Table 5-10 GWTS Non-Routine Maintenance Items, Q3 2020
23	The Permittee shall monitor the groundwater wells in the vicinity of KAFB-7 and in the vicinity of any newly installed UIC well(s) to determine any change to aquifer chemistry that may be the result of injection.	Not applicable in Q3 2020
	This monitoring shall be performed annually, shall conform to the procedures of the most current approved Work Plan, and shall measure the COCs listed in Table 2. This chemistry will be reported in the Annual Report for BFF.	Provided in this Q4 2019 Report; Section 5.2.1.1
	ST-105 Annual Report includes elevation contour mapping and analytical parameters identified in the Stage 2 Abatement Plan.	Reported annually in the ST-105 Annual Report
	The Permittee shall develop a groundwater elevation contour map depicting the groundwater flow direction in the vicinity of each UIC well and report it in the ST-105 Annual Report.	Reported annually in the ST-105 Annual Report Also reported in Q4 of each year, last reported in Q4 2019
	If the chemical quality of the treated groundwater being injected changes over time, NMED may require the Permittee to repeat geochemical modeling (numeric or analytical) to predict the interaction between the treated effluent and receiving groundwater. [20.6.2.3107 NMAC]	Not applicable in Q3 2020
24	The Permittee shall post all reports required by this Discharge Permit on Kirtland AFB's most current website (e.g., https://kirtlandafb.tlisolutions.com/main.aspx.) [20.6.2.3107(A) NMAC]	http://afcec.publicadmin-record.us.af.mil/search.aspx

Table 5-1
DP-1839 Discharge Permit Terms and Conditions, Operations and Maintenance Plan Cross References

Condition No.	Terms and Conditions	Reference Location in Quarterly Report
34	In the event the Permittee proposes a change to the facility or the facility's discharge that would result in a change in the volume discharged; the location of the discharge; or in the amount or character of water contaminants received, treated, or discharged by the facility that differs from the terms and conditions in this Discharge Permit, the Permittee shall notify NMED prior to implementing such changes.	Noted
	The Permittee shall obtain approval (which may require modification of this Discharge Permit) by NMED prior to implementing such changes. [20.6.2.7(P) NMAC, 20.6.2.3107(C) NMAC, 20.6.2.3109(E) and (G) NMAC]	Noted
35	In the event the Permittee proposes to construct or change an existing system such that the quantity or quality of the discharge will change substantially from that authorized by this Discharge Permit, the Permittee shall submit construction plans and specifications to NMED for the proposed system or process unit prior to the commencement of construction.	Noted
	In the event the Permittee implements changes to an existing system authorized by this Discharge Permit which will result in only a minor effect on the quality of the discharge, the Permittee shall report such changes (including the submission of record drawings, where applicable) in the next quarterly report to NMED. [20.6.2.1202(A) and (C) NMAC, New Mexico Statutes Annotated 1978, §§ 61-23-1 through 61-23-32]	Not applicable in Q3 2020

BFF = Bulk Fuels Facility
COC = contaminant of concern
GAC = granular activated carbon
GWTS = groundwater treatment system
GWQB = Groundwater Quality Bureau
HWB = Hazardous Waste Bureau
NMAC = New Mexico Administrative Code
NMED = New Mexico Environment Department
No. = number
O&M = Operation and maintenance
Q2 = second quarter
Q3 = third quarter
Q4 = fourth quarter
UIC = underground injection control

Table 5-2
Groundwater Treatment System Extraction Well Performance, Q3 2020

Well ID	Well Parameter	July	August	September	Q3 (Average)
KAFB-106228	Average Operational Flow Rate[a] (gpm)	143.2	142.6	141.7	142.5
	Flow Rate Range[b] (gpm; min-max)	0.0 - 144.0	141.9 - 142.9	140.7 - 145.1	0.0 - 145.1
	Average Drawdown[c] (ft)	18.9	20.7	22.3	20.6
	Water Level Elevation Range[b] (ft AMSL; min-max)	4859.3 - 4879.6	4858.0 - 4859.7	4856.8 - 4857.9	4856.8 - 4879.6
	Average Specific Capacity[d] (gpm/ft)	7.3	6.9	6.4	6.9
	Average Transmissivity[d] (gpd/ft)	10,992	10,317	9,547	10,286
	Run Time %[e]	88.7%	99.3%	99.8%	95.7%
	Notes	NA	NA	NA	NA
KAFB-106233	Average Operational Flow Rate[a,f] (gpm)	165.8	164.4	162.4	164.1
	Flow Rate Range[b] (gpm; min-max)	0.0 - 166.2	0.0 - 166.1	0.0 - 163.2	0.0 - 166.2
	Average Drawdown[c] (ft)	4.5	6.6	7.6	6.2
	Water Level Elevation Range[b] (ft AMSL; min-max)	4871.0 - 4877.9	4870.4 - 4876.1	4869.4 - 4875.9	4869.4 - 4877.9
	Average Specific Capacity[d] (gpm/ft)	26.7	23.1	20.4	23.2
	Average Transmissivity[d] (gpd/ft)	40,040	34,687	30,598	34,729
	Run Time %[e]	58.0%	89.0%	88.6%	78.1%
	Notes	Intermittently Online[g]	Intermittently Online[g]	Intermittently Online[g]	Intermittently Online[g]
KAFB-106234	Average Operational Flow Rate[a] (gpm)	174.7	174.2	174.2	174.4
	Flow Rate Range[b] (gpm; min-max)	0.0 - 175.9	173.7 - 175.6	173.5 - 175.6	0.0 - 175.9
	Average Drawdown[c] (ft)	6.3	7.9	9.2	7.8
	Water Level Elevation Range[b] (ft AMSL; min-max)	4871.3- 4878.5	4869.9 - 4871.3	4868.8 - 4870.0	4868.8 - 4878.5
	Average Specific Capacity[d] (gpm/ft)	27.7	22.1	19.0	22.9
	Average Transmissivity[d] (gpd/ft)	41,581	33,191	28,463	34,398
	Run Time %[e]	88.7%	99.3%	99.9%	95.8%
	Notes	NA	NA	NA	NA
KAFB-106239	Average Operational Flow Rate[a] (gpm)	70.0	73.6	74.5	72.7
	Flow Rate Range[b] (gpm; min-max)	0.0 - 74.4	72.9 - 74.5	0.0 - 75.9	0.0 - 75.9
	Average Drawdown[c] (ft)	10.1	11.9	12.8	11.6
	Water Level Elevation Range[b] (ft AMSL; min-max)	4874.1 - 4885.3	4872.6 - 4874.1	4871.9 - 4885.3	4871.9 - 4885.3
	Average Specific Capacity[d] (gpm/ft)	7.1	6.2	5.8	6.4
	Average Transmissivity[d] (gpd/ft)	10,648	9,281	8,758	9,568
	Run Time %[e]	88.7%	99.0%	96.4%	94.6%
	Notes	NA	NA	NA	NA
Combined Extraction Well Totals	Combined Average Operational Flow Rate[h] (gpm)	509.6	538.9	539.5	529.4
	Combined Flow Rate Range (gpm)	0.0 - 559.2	390.7 - 556.4	390.1 - 555.9	0.0 - 559.2
	Run Time %[i]	88.7%	99.3%	100.0%	96.0%

Table 5-2
Groundwater Treatment System Extraction Well Performance, Q3 2020

[a] Flow rate calculation is an average rate that only includes time while the pump was operational; average values were computed from daily values throughout Q3 2020.

[b] Ranges are provided from daily values throughout Q3 2020.

[c] Average drawdown is calculated from the approximate static water elevation in Q3 2020, only includes time while the pump was operational and does not account for dynamic water elevation increases in the aquifer; average values were computed from daily values throughout Q3 that were obtained from the SCADA for all the extraction wells.

[d] Specific capacity and transmissivity average values only include pump run time (i.e., pump down time is not factored into the calculation); average values were computed from daily values throughout Q3.

e Percent run time is calculated when the given well is running at a minimum of 50 gpm; dataset includes readings for every minute throughout Q3.

[f] Due to temporary limited run-time pending maintenance of KAFB-7, the indicated flowrates for KAFB-106233 only apply during periods of active extraction.

[g] KAFB-106233 was intermittently online in July, August, and September to maintain water level at the Tijeras Arroyo Golf Course Main Pond.

[h] Combined Average Operation Flow Rate is the average influent flow rate to the GWTS.

[i] The combined extraction well percent run time is based on the percentage of time that water is entering the GWTS from any combination of extraction wells.

% = percent

AMSL = above mean sea level

ft = foot (feet)

gpd = gallon per day
gpm = gallon per minute
GWTS = groundwater treatment system
ID = identification
max = maximum
min = minimum
NA = not applicable
Q3 = third quarter
SCADA = supervisory control and data acquisition

Table 5-3
Cumulative Quantities of Groundwater Treated and Discharged through Q3 2020

GWTS Operating Month	Train 1 Total Groundwater Treated (gallons)	Train 2 Total Groundwater Treated (gallons)	Total Groundwater Extracted (gallons)	Treated Groundwater Injected to Injection Well KAFB-7 (gallons)	Treated Groundwater Discharged to the GCMP[a] (gallons)
Totalizing Flowmeter[b]	FE/FIT-3108	FE/FIT-3208	FE/FIT-3108 + FE/FIT-3208	FE/FIT-3108 + FE/FIT-3208	FE/FIT-3108 + FE/FIT-3208
December 2015[c]	17,664,900	0	17,664,900	0	17,664,900
2015 Total	**17,664,900**	**0**	**17,664,900**	**0**	**17,664,900**
January 2016	1,777,200	0	1,777,200	0	1,777,200
February 2016	881,000	0	881,000	181,300	699,700
March 2016	22,168,080	0	22,168,080	1,231,350	20,936,730
April 2016	12,649,920	0	12,649,920	582,570	12,067,350
May 2016	12,090,000	0	12,090,000	0	12,090,000
June 2016	8,850,000	0	8,850,000	0	8,850,000
July 2016	9,940,000	0	9,940,000	0	9,940,000
August 2016	9,400,000	0	9,400,000	0	9,400,000
September 2016	12,980,000	0	12,980,000	0	12,980,000
October 2016	8,300,000	0	8,300,000	0	8,300,000
November 2016	7,200,000	0	7,200,000	2,970,000	4,230,000
December 2016	14,570,100	0	14,570,100	14,501,190	68,910
2016 Total	**120,806,300**	**0**	**120,806,300**	**19,466,410**	**101,339,890**
January 2017	6,089,700	87,300	6,177,000	5,877,600	299,400
February 2017	1,637,100	2,357,400	3,994,500	2,216,600	1,777,900
March 2017	5,551,200	5,705,400	11,256,600	5,172,800	6,083,800
April 2017	7,269,000	6,712,700	13,981,700	2,248,062	11,733,638
May 2017	9,234,900	9,453,700	18,688,600	4,722,563	13,966,037
June 2017	9,706,100	9,055,100	18,761,200	1,592,700	17,168,500
July 2017	13,260,800	10,875,200	24,136,000	3,023,500	21,112,500
August 2017	9,461,200	8,999,500	18,460,700	4,847,500	13,613,200
September 2017	9,734,500	9,227,600	18,962,100	6,752,400	12,209,700
October 2017	8,684,700	12,941,900	21,626,600	14,775,800	6,850,800
November 2017	0	12,513,400	12,513,400	3,734,900	8,778,500
December 2017	0	13,304,300	13,304,300	10,724,700	2,579,600
2017 Total	**80,629,200**	**101,233,500**	**181,862,700**	**65,689,125**	**116,173,575**
January 2018	9,865,000	5,497,700	15,362,700	13,887,700	1,475,000
February 2018	10,785,300	6,786,100	17,571,400	13,765,300	3,806,100
March 2018	11,006,000	7,092,900	18,098,900	9,235,300	8,863,600
April 2018	7,468,200	5,800,700	13,268,900	0[d]	13,268,900
May 2018	11,238,400	8,061,600	19,300,000	0[d]	19,300,000

Table 5-3
Cumulative Quantities of Groundwater Treated and Discharged through Q3 2020

GWTS Operating Month	Train 1 Total Groundwater Treated (gallons)	Train 2 Total Groundwater Treated (gallons)	Total Groundwater Extracted (gallons)	Treated Groundwater Injected to Injection Well KAFB-7 (gallons)	Treated Groundwater Discharged to the GCMP[a] (gallons)
June 2018	14,746,800	10,186,400	24,933,200	0[d]	24,933,200
July 2018	12,038,500	7,901,100	19,939,600	0[d]	19,939,600
August 2018	14,973,100	9,583,900	24,557,000	0[d]	24,557,000
September 2018	9,516,900	7,509,600	17,026,500	0[d]	17,026,500
October 2018	1,572,600	7,288,500	8,861,100	0[d]	8,861,100
November 2018	7,788,300	4,682,900	12,471,200	7,517,100	4,954,100
December 2018	15,521,500	10,282,100	25,803,600	23,080,800	2,722,800
2018 Total	**126,520,600**	**90,673,500**	**217,194,100**	**67,486,200**	**149,707,900**
January 2019	13,105,900	8,431,000	21,536,900	19,494,500	2,042,400
February 2019	12,821,800	8,443,300	21,265,100	13,624,600	7,640,500
March 2019	16,066,200	10,450,300	26,516,500	13,435,900	13,080,600
April 2019	12,729,900	8,472,000	21,201,900	7,170,800	14,031,100
May 2019	12,789,200	10,082,100	22,871,300	5,779,900	17,091,400
June 2019	9,569,300	7,798,200	17,367,500	1,512,500	15,855,000
July 2019	9,153,800	8,748,700	17,902,500	551,100	17,351,400
August 2019	17,091,500	10,580,700	27,672,200	5,494,800	22,177,400
September 2019	12,899,200	7,297,200	20,196,400	2,916,700	17,279,700
October 2019	13,112,400	10,391,900	23,504,300	17,177,900	6,326,400
November 2019	7,060,700	8,546,700	15,607,400	14,525,700	1,081,700
December 2019	7,330,400	8,499,400	15,829,800	15,695,800	134,000
Q4 2019 Total	**27,503,500**	**27,438,000**	**54,941,500**	**47,399,400**	**7,542,100**
2019 Total	**143,730,300**	**107,741,500**	**251,471,800**	**117,380,200**	**134,091,600**
January 2020	9,025,600	10,401,500	19,427,100	18,919,600	507,500
February 2020	6,985,200	8,249,600	15,234,800	12,237,600	2,997,200
March 2020	7,280,800	8,168,800	15,449,600	4,246,900	11,202,700
April 2020	9,547,500	10,804,400	20,351,900	5,110,300	15,241,600
May 2020	10,550,000	8,680,400	19,230,400	395,600	18,834,800
June 2020	12,585,900	7,964,600	20,550,500	0	20,550,500
July 2020	15,683,800	7,048,500	22,732,300	1,550,800	21,181,500
August 2020	12,873,600	8,529,500	21,403,100	3,737,000	17,666,100
September 2020[e]	12,823,300	8,452,900	21,276,200	4,711,800	16,564,400
Q3 2020 Total	**41,380,700**	**24,030,900**	**65,411,600**	**9,999,600**	**55,412,000**
2020 Total[f]	**97,355,700**	**78,300,200**	**175,655,900**	**50,909,600**	**124,746,300**
Cumulative Total	**586,707,000**	**377,948,700**	**964,655,700**	**320,931,535**	**643,724,165**

Table 5-3
Cumulative Quantities of Groundwater Treated and Discharged through Q3 2020

[a] Corrected volumes from human machine interface datasets.

[b] Flowmeters are inspected monthly, see Appendix I-1.

[c] Train 1 treatment volume for December 2015 includes all water treated by the temporary treatment system and water treated by Train 1 during December 2015.

[d] On March 14, 2018 at 0206, the KAFB-7 V-Smart valve hydraulic assembly failed downhole. Repairs to KAFB-7 were completed on November 14, 2018. All treated water between March 14, 2018 and November 15, 2018 was discharged to the GCMP.

[e] Treatment volumes for September 2020 are calculated through September 28, 2020.

[f] Cumulative 2020 total through September 28, 2020.

FE/FIT-3208 = Flowmeter/flow meter transmitter (followed by the component designation)

GCMP = Tijeras Arroyo Golf Course main pond

GWTS = groundwater treatment system

Q3 = third quarter

Table 5-4
Groundwater Treatment System Injection Well Performance, Q3 2020

Well ID	Well Parameter	July	August	September	Q3 (average)
KAFB-7	Average Operational Flow Rate[a] (gpm)	624.8	642.8	640.1	638.6
	Flow Rate Range[b] (gpm; min-max)	0.0 - 672.8	0.0 - 667.1	0.0 - 641.6	0.0 - 672.8
	Volume Injected[c] (gal)	1,550,800	3,737,000	4,711,800	3,333,200
	Average Water Level Elevation[d] (ft AMSL)	4891.0	4894.9	4,900.9	4896.5
	Water Level Elevation Range[d] (ft AMSL; min-max	4882.4 - 4930.1	4882.2 - 4934.2	4881.9 - 4939.7	4881.9 - 4939.7
	Run Time (%)	12.9%	29.0%	36.7%	26.1%
	Notes	NA	NA	NA	NA
GWTS Effluent	Average Operational Flow Rate[a] (gpm)	558.8	628.7	632.2	606.8
	Flow Rate Range[b] (gpm; min-max)	0.0 - 652.1	519.8 - 644.5	520.5 - 641.6	0.0 - 652.1

[a] Flow rate calculation is an average rate that only includes time while the system was operational; average values were computed from SCADA values throughout Q3 2020.

[b] Ranges are provided from SCADA values throughout Q3 2020. KAFB-7 flow rate fluctuates due to surging, etc. and is not consistent with GWTS effluent flow rates.

[c] Volume injected is calculated using totalizer readings from flow meters installed on the GWTS effluent skids. September injection volume calculated through September 28, 2020.

[d] Water level elevation averages and ranges include times when injection wells are not being utilized and data was collected from the SCADA for Q3 2020.

% = percent
AMSL = above mean sea level
ft = foot (feet)
gal = gallon(s)
gpm = gallons per minute
GWTS = groundwater treatment system
ID = identification
max = maximum
min = minimum
NA = not applicable
SCADA = supervisory control and data acquisition
Q3 = third quarter

Table 5-5
Groundwater Treatment System Ethylene Dibromide Removal, Q3 2020

Treatment Train	Month	Date[a]	Cumulative Volume Extracted (gal)	Monthly Volume Treated (gal)	Influent EDB Concentration (µg/L)[b]	Cumulative Mass of EDB Extracted (mg)	Mass of EDB Removed (mg)[c]
Train 1	July	6/29/2020	545,326,300	15,683,800	ND < 0.019	81,582	0
		7/6/2020	548,895,900		ND < 0.019	81,582	
		7/13/2020	551,284,100		ND < 0.019	81,582	
		7/20/2020	554,220,300		ND < 0.019	81,582	
		7/27/2020	557,607,300		ND < 0.019	81,582	
	August	8/3/2020	561,010,100	12,873,600	ND < 0.019	81,582	0
		8/10/2020	564,437,200		ND < 0.019	81,582	
		8/17/2020	567,814,400		ND < 0.019	81,582	
		8/24/2020	571,169,600		ND < 0.019	81,582	
		8/31/2020	573,883,700		ND < 0.019	81,582	
	September	9/8/2020	577,015,900	12,823,300	ND < 0.019	81,582	440
		9/14/2020	579,939,100		0.012	81,715	
		9/21/2020	583,328,400		0.012	81,869	
		9/28/2020	586,707,000		0.012	82,023	
Train 2	July	6/29/2020	353,917,800	7,048,500	0.024	46,989	721
		7/6/2020	355,144,700		0.024	47,100	
		7/13/2020	355,214,800		0.024	47,107	
		7/20/2020	356,695,200		0.024	47,241	
		7/27/2020	358,827,700		0.029	47,475	
	August	8/3/2020	360,966,300	8,529,500	0.029	47,710	904
		8/10/2020	363,112,900		0.028	47,938	
		8/17/2020	365,231,000		0.028	48,162	
		8/24/2020	367,345,700		0.028	48,386	
		8/31/2020	369,495,800		0.028	48,614	
	September	9/8/2020	371,930,600	8,452,900	0.028	48,872	805
		9/14/2020	373,650,400		0.024	49,028	
		9/21/2020	375,801,700		0.024	49,224	
		9/28/2020	377,948,700		0.024	49,419	

Table 5-5
Groundwater Treatment System Ethylene Dibromide Removal, Q3 2020

Treatment Train	Month	Date[a]	Cumulative Volume Extracted (gal)	Monthly Volume Treated (gal)	Influent EDB Concentration (µg/L)[b]	Cumulative Mass of EDB Extracted (mg)	Mass of EDB Removed (mg)[c]
Q3 2020 Train 1 Total				41,380,700			440
Q3 2020 Train 2 Total				24,030,900			2,430
Q3 2020 Total				65,411,600			2,870

[a] Monthly date ranges may include dates falling outside of the actual month as weekly human machine interface data retrievals occur every Monday.

[b] The analytical result from the most recent monthly sample is used for the influent EDB concentration (Tables 5-6 and 5-7). Where EDB is non-detect, a concentration of 0 is used for the purpose of mass calculation and is displayed in this table as ND < [LOD].

[c] The mass of EDB removed is the sum of the weekly mass of EDB removed, which is the influent EDB concentration multiplied by the weekly treated volume, which is calculated each Monday from the difference in effluent totalizer readings since the previous Monday.

< = less than
µg/L = microgram per liter
EDB = ethylene dibromide
gal = gallon(s)
LOD = limit of detection
mg = milligram(s)
ND = nondetect
Q3 = third quarter

Table 5-6
Groundwater Treatment System Train 1 Monthly Analytical Results, Q3 2020

Parameter	Analytical Method	Analyte	NMAC NMWQCC[a]	EPA MCL[b]	EPA RSL[c]	Project Screening Level[d]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
						Well Location ID:	GWTS-BFF-INF1			GWTS-BFF-GAC1			GWTS-BFF-EFF1			GWTS-BFF-INF1		
						Field Sample ID:	GWTS-INF1-072320			GWTS-GAC1-072320			GWTS-EFF1-072320			GWTS-INF1-080520		
						Sample Date:	7/23/2020			7/23/2020			7/23/2020			8/5/2020		
						Sample Type:	REG			REG			REG			REG		
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.05	0.075	0.05	ND	U	0.019	0.01	J	0.019	ND	U	0.019	ND	U	0.019
VOCs	Method SW8260C (µg/L)	Benzene	5	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	NS	NS	1	ND	U	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
Field Parameters		Temperature (°C)	NS	NS	NS	NS	20.3			20.4			20.4			20.4		
		Spec Cond (µS/cm)	NS	NS	NS	NS	578			577			577			480.4		
		pH (S.U.)	NS	NS	NS	NS	7.82			7.53			7.42			7.74		
		ORP (mV)	NS	NS	NS	NS	281.9			281.4			333.0			332.8		
		DO (mg/L)	NS	NS	NS	NS	6.21			3.83			5.54			6.38		

Table 5-6
Groundwater Treatment System Train 1 Monthly Analytical Results, Q3 2020

						Well Location ID:	GWTS-BFF-GAC1			GWTS-BFF-EFF1			GWTS-BFF-EFF1			GWTS-BFF-INF1		
						Field Sample ID:	GWTS-GAC1-080520			GWTS-EFF1-080520			GWTS-EFF1DUP-080520			GWTS-INF1-090920		
						Sample Date:	8/5/2020			8/5/2020			8/5/2020			9/9/2020		
						Sample Type:	REG			REG			Field Duplicate			REG		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.05	0.075	0.05	ND	U	0.019	ND	U	0.019	ND	U	0.019	0.012	J	0.019
VOCs	Method SW8260C (µg/L)	Benzene	5	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	NS	NS	1	ND	U	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
Field Parameters		Temperature (°C)	NS	NS	NS	NS	20.4			20.4			20.4			20.2		
		Spec Cond (µS/cm)	NS	NS	NS	NS	479.8			479.4			479.4			480.1		
		pH (S.U.)	NS	NS	NS	NS	7.46			7.35			7.35			7.72		
		ORP (mV)	NS	NS	NS	NS	334.1			395.5			395.5			191.6		
		DO (mg/L)	NS	NS	NS	NS	4.26			5.94			5.94			6.18		

Table 5-6
Groundwater Treatment System Train 1 Monthly Analytical Results, Q3 2020

						Well Location ID:	GWTS-BFF-GAC1			GWTS-BFF-EFF1		
						Field Sample ID:	GWTS-GAC1-090920			GWTS-EFF1-090920		
						Sample Date:	9/9/2020			9/9/2020		
						Sample Type:	REG			REG		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.05	0.075	0.05	0.021	J	0.019	ND	U	0.019
VOCs	Method SW8260C (µg/L)	Benzene	5	5	4.5	5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	700	15	700	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	NS	NS	1	ND	U	0.1	ND	UJ	0.1
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	UJ	0.0052
Field Parameters		Temperature (°C)	NS	NS	NS	NS	20.0			20.1		
		Spec Cond (µS/cm)	NS	NS	NS	NS	479.6			478.5		
		pH (S.U.)	NS	NS	NS	NS	7.44			7.36		
		ORP (mV)	NS	NS	NS	NS	182.9			314.2		
		DO (mg/L)	NS	NS	NS	NS	3.95			5.67		

Table 5-6
Groundwater Treatment System Train 1 Monthly Analytical Results, Q3 2020

[a] NMWQCC numeric standards per the New Mexico Administrative Code Title 20.6.2.3101A, Standards for Groundwater of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC, 2018).

[b] EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Part 141, 143 (May 2018).

[c] EPA Region 6 RSL for Tapwater (May 2020) for hazard index = 1.0 for noncarcinogens and a 10-5 cancer risk level for carcinogens.

[d] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC numeric standard or MCL exists for any analyte, then the project screening level will be the EPA RSL.

µg/L = microgram per liter
µS/cm = microSiemens per centimeter
ºC = degree Celsius
AFB = Air Force Base
DO = dissolved oxygen
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
mg/L= milligram per liter
mV = millivolt
ND = nondetect
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
NS = not specified
ORP = oxidation reduction potential
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
Spec Cond = specific conductivity
S.U. = standard unit
Val Qual = validation qualifier
VOC = volatile organic compound
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation:
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
-- = Validation qualifier not assigned.

Table 5-7
Groundwater Treatment System Train 2 Monthly Analytical Results, Q3 2020

						Well Location ID:	GWTS-BFF-INF2			GWTS-BFF-GAC2			GWTS-BFF-EFF2			GWTS-BFF-EFF2		
						Field Sample ID:	GWTS-INF2-072320			GWTS-GAC2-072320			GWTS-EFF2-072320			GWTS-EFF2DUP-072320		
						Sample Date:	7/23/2020			7/23/2020			7/23/2020			7/23/2020		
						Sample Type:	REG			REG			REG			Field Duplicate		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.05	0.075	0.05	0.029	--	0.019	0.011	J	0.019	ND	U	0.019	ND	U	0.019
VOCs	Method SW8260C (µg/L)	Benzene	5	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	NS	NS	1	ND	U	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Manganese, dissolved	0.2	NS	NS	0.2	0.0047	J	0.0052	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
Field Parameters		Temperature (°C)	NS	NS	NS	NS	20.8			20.7			20.7			20.7		
		Spec Cond (µS/cm)	NS	NS	NS	NS	443.6			441.7			442.6			442.6		
		pH (S.U.)	NS	NS	NS	NS	7.80			7.39			7.40			7.4		
		ORP (mV)	NS	NS	NS	NS	550.9			81.8			306.0			306.0		
		DO (mg/L)	NS	NS	NS	NS	5.25			1.07			4.68			4.68		

Table 5-7
Groundwater Treatment System Train 2 Monthly Analytical Results, Q3 2020

						Well Location ID:	GWTS-BFF-INF2			GWTS-BFF-GAC2			GWTS-BFF-EFF2			GWTS-BFF-INF2		
						Field Sample ID:	GWTS-INF2-080520			GWTS-GAC2-080520			GWTS-EFF2-080520			GWTS-INF2-090920		
						Sample Date:	8/5/2020			8/5/2020			8/5/2020			9/9/2020		
						Sample Type:	REG			REG			REG			REG		
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.05	0.075	0.05	0.028	J	0.019	ND	U	0.019	ND	U	0.019	0.024	J	0.019
VOCs	Method SW8260C (µg/L)	Benzene	5	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	NS	NS	1	ND	U	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Manganese, dissolved	0.2	NS	NS	0.2	0.005	J	0.0052	ND	U	0.0052	ND	U	0.0052	0.0053	J	0.0052
Field Parameters		Temperature (°C)	NS	NS	NS	NS	20.6			20.7			20.8			20.5		
		Spec Cond (µS/cm)	NS	NS	NS	NS	371.4			370.2			370.1			369.9		
		pH (S.U.)	NS	NS	NS	NS	7.70			7.3			7.23			7.57		
		ORP (mV)	NS	NS	NS	NS	378.8			378.8			273.3			584.3		
		DO (mg/L)	NS	NS	NS	NS	5.72			1.33			4.62			5.59		

Table 5-7
Groundwater Treatment System Train 2 Monthly Analytical Results, Q3 2020

		Well Location ID:					GWTS-BFF-GAC2			GWTS-BFF-EFF2			GWTS-BFF-EFF2	
		Field Sample ID:					GWTS-GAC2-090920			GWTS-EFF2-090920			GWTS-EFF2DUP-090920	
		Sample Date:					9/9/2020			9/9/2020			9/9/2020	
		Sample Type:					REG			REG			Field Duplicate	
Parameter	**Analytical Method**	**Analyte**	**NMAC NMWQCC[a]**	**EPA MCL[b]**	**EPA RSL[c]**	**Project Screening Level[d]**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**	**Result**	**Val Qual**	**LOD**
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.05	0.075	0.05	0.015	J	0.019	ND[e]	R	0.019	ND	U	0.019
VOCs	Method SW8260C (µg/L)	Benzene	5	5	4.5	5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Ethylbenzene	700	700	15	700	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Toluene	1,000	1,000	1,100	1,000	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	10,000	190	620	ND	U	2	ND	U	2	ND	U	2
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	NS	NS	1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Manganese, dissolved	0.2	NS	NS	0.2	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
Field Parameters		Temperature (°C)	NS	NS	NS	NS	20.4			20.4			20.4		
		Spec Cond (µS/cm)	NS	NS	NS	NS	368.4			368.8			368.8		
		pH (S.U.)	NS	NS	NS	NS	7.27			7.26			7.26		
		ORP (mV)	NS	NS	NS	NS	167.7			163.0			163.0		
		DO (mg/L)	NS	NS	NS	NS	1.41			4.41			4.41		

Table 5-7
Groundwater Treatment System Train 2 Monthly Analytical Results, Q3 2020

[a] NMWQCC numeric standards per the New Mexico Administrative Code Title 20.6.2.3101A, Standards for Groundwater of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC, 2018).

[b] EPA National Primary Drinking Water Regulations, MCLs and Secondary MCLs, Title 40 CFR Part 141, 143 (May 2018).

[c] EPA Region 6 RSL for Tapwater (May 2020) for hazard index = 1.0 for noncarcinogens and a 10-5 cancer risk level for carcinogens.

[d] The project screening level was selected to satisfy the requirements of the Kirtland AFB Hazardous Waste Permit Number NM9570024423 as the lowest of (1) NMWQCC numeric standard or (2) EPA MCL. If no NMQWCC numeric standard or MCL exists for any analyte, then the project screening level will be the EPA RSL.

[e] The September 9, 2020, effluent EDB concentration for Train 2 was originally detected at an estimated 0.013 J µg/L. Subsequent monthly sampling result and the duplicate was returned as nondetect.

µg/L = microgram per liter
µS/cm = microSiemens per centimeter
ºC = degree Celsius
AFB = Air Force Base
DO = dissolved oxygen
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
mg/L= milligram per liter
mV = millivolt
ND = nondetect
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
NS = not specified
ORP = oxidation reduction potential
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
Spec Cond = specific conductivity
S.U. = standard unit
Val Qual = validation qualifier
VOC = volatile organic compound
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the project screening level
Val Quals based on independent data validation:
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
R = Qualifier denotes the result is considered rejected data based on professional judgement (not usable to achieve project objectives) due to comparability to the field duplicate sample collected the same day and the subsequent sample data.
-- = Validation qualifier not assigned.

Table 5-8
Groundwater Treatment System Annual Sample Analytical Results, Q3 2020

			Well Location ID:	GWTS-BFF-INF1			GWTS-BFF-INF1			GWTS-BFF-GAC1			GWTS-BFF-EFF1			GWTS-BFF-EFF1		
			Field Sample ID:	GWTS-INF1-072320			GWTS-INF1-082620			GWTS-GAC1-072320			GWTS-EFF1-072320			GWTS-EFF1-082620		
			Sample Date:	7/23/2020			8/26/2020			7/23/2020			7/23/2020			8/26/2020		
			Sample Type:	REG			REG			REG			REG			REG		
Parameter	Analytical Method	Analyte	NMAC NMWQCC[a]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	ND	U	0.019	—	—	—	0.01	J	0.019	ND	U	0.019	—	—	—
VOCs	Method SW8260C (µg/L)	1,1,2,2-Tetrachloroethane	10	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		1,1,2-Trichloroethane	10	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		1,1-Dichloroethane	25	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		1,2-Dibromoethane	0.1	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		1,2-Dichloroethane	5	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5	—	—	—
		Benzene	10	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Chloroform	100	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Cis-1,2-Dichloroethene	NS	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Dibromochloromethane	NS	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Ethylbenzene	750	ND	U	0.8	—	—	—	ND	U	0.8	ND	U	0.8	—	—	—
		Methyl tert-butyl ether	NS	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Methylene chloride	100	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Naphthalene	30	ND	U	2	—	—	—	—	—	—	ND	U	2	—	—	—
		Tetrachloroethene	20	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Toluene	750	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5	—	—	—
		Trichloroethene	100	ND	U	0.5	—	—	—	—	—	—	ND	U	0.5	—	—	—
		Xylenes, total	620	ND	U	2	—	—	—	ND	U	2	ND	U	2	—	—	—
SVOCs	Method SW8270D (µg/L)	1-Methylnaphthalene	30	—	—	—	ND	UJ	0.21	—	—	—	—	—	—	ND	UJ	0.21
		2-Methylnaphthalene	30	—	—	—	ND	UJ	0.21	—	—	—	—	—	—	ND	UJ	0.21
		Bis(2-ethylhexyl) phthalate	NS	—	—	—	ND	UJ	10	—	—	—	—	—	—	ND	UJ	11
		Naphthalene	30[b]	—	—	—	ND	UJ	0.21	—	—	—	—	—	—	ND	UJ	0.21
		Pyrene	NS	—	—	—	ND	UJ	0.21	—	—	—	—	—	—	ND	UJ	0.21
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	ND	U	0.1	—	—	—	ND	U	0.1	ND	U	0.1	—	—	—
		Manganese, dissolved	0.2	ND	U	0.0052	—	—	—	ND	U	0.0052	ND	U	0.0052	—	—	—
Anions	Method E300.0 (mg/L)	Chloride	250	61	J	60	—	—	—	—	—	—	52	J	60	—	—	—
		Sulfate	600	83	J	180	—	—	—	—	—	—	80	J	180	—	—	—
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[c]	1.1	--	0.09	—	—	—	—	—	—	1.1	--	0.09	—	—	—
Phenols	Method E420.4 (mg/L)	Phenols	0.005	ND	U	0.015	—	—	—	—	—	—	ND	U	0.015	—	—	—

Table 5-8
Groundwater Treatment System Annual Sample Analytical Results, Q3 2020

			Well Location ID:	GWTS-BFF-INF2			GWTS-BFF-GAC2			GWTS-BFF-EFF2			GWTS-BFF-EFF2		
			Field Sample ID:	GWTS-INF2-072320			GWTS-GAC2-072320			GWTS-EFF2-072320			GWTS-EFF2DUP-072320		
			Sample Date:	7/23/2020			7/23/2020			7/23/2020			7/23/2020		
			Sample Type:	REG			REG			REG			Field Duplicate		
Parameter	Analytical Method	Analyte	NMAC NMWQCC[a]	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD	Result	Val Qual	LOD
EDB	Method SW8011 (µg/L)	1,2-Dibromoethane	0.1	0.029		0.019	0.011	J	0.019	ND	U	0.019	ND	U	0.019
VOCs	Method SW8260C (µg/L)	1,1,2,2-Tetrachloroethane	10	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		1,1,2-Trichloroethane	10	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		1,1-Dichloroethane	25	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		1,2-Dibromoethane	0.1	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		1,2-Dichloroethane	5	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Benzene	10	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Chloroform	100	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Cis-1,2-Dichloroethene	NS	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Dibromochloromethane	NS	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Ethylbenzene	750	ND	U	0.8	ND	U	0.8	ND	U	0.8	ND	U	0.8
		Methyl tert-butyl ether	NS	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Methylene chloride	100	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Naphthalene	30	ND	U	2	—	—	—	ND	U	2	ND	U	2
		Tetrachloroethene	20	ND	UJ	0.5	—	—	—	ND	UJ	0.5	ND	UJ	0.5
		Toluene	750	ND	U	0.5	ND	U	0.5	ND	U	0.5	ND	U	0.5
		Trichloroethene	100	ND	U	0.5	—	—	—	ND	U	0.5	ND	U	0.5
		Xylenes, total	620	ND	U	2	ND	U	2	ND	U	2	ND	U	2
SVOCs	Method SW8270D (µg/L)	1-Methylnaphthalene	30	—	—	—	—	—	—	—	—	—	—	—	—
		2-Methylnaphthalene	30	—	—	—	—	—	—	—	—	—	—	—	—
		Bis(2-ethylhexyl) phthalate	NS	—	—	—	—	—	—	—	—	—	—	—	—
		Naphthalene	30[b]	—	—	—	—	—	—	—	—	—	—	—	—
		Pyrene	NS	—	—	—	—	—	—	—	—	—	—	—	—
Dissolved Metals	Method SW6010C (mg/L)	Iron, dissolved	1.0	ND	U	0.1	ND	U	0.1	ND	U	0.1	ND	U	0.1
		Manganese, dissolved	0.2	0.0047	J	0.0052	ND	U	0.0052	ND	U	0.0052	ND	U	0.0052
Anions	Method E300.0 (mg/L)	Chloride	250	20	--	1.5	—	—	—	20	--	1.5	19	--	1.5
		Sulfate	600	36	--	4.5	—	—	—	36	--	4.5	35	--	4.5
	Method E353.2 (mg/L)	Nitrate/Nitrite Nitrogen	10[c]	0.2	--	0.09	—	—	—	0.19	--	0.09	0.17	--	0.09
Phenols	Method E420.4 (mg/L)	Phenols	0.005	ND	U	0.015	—	—	—	ND	U	0.015	ND	U	0.015

Table 5-8
Groundwater Treatment System Annual Sample Analytical Results, Q3 2020

[a] NMWQCC numeric standards per the New Mexico Administrative Code Title 20.6.2.3101A, Standards for Groundwater of 10,000 mg/L Total Dissolved Solids Concentration or Less (NMAC 2018).
[b] NMWQCC standard represents total naphthalene and monomethylnaphthalene.
[c] Based on the geochemical equilibrium of the site groundwater and previous site data analyses, nitrate/nitrite results represent nitrate concentrations.
— = Compound not analyzed for.
µg/L = microgram per liter
EDB = ethylene dibromide (1,2-dibromoethane)
EPA = U.S. Environmental Protection Agency
ft = foot/feet
ID = identification
LOD = limit of detection
MCL = maximum contaminant level
mg/L= milligram per liter
ND = nondetect
NMAC = New Mexico Administrative Code
NMWQCC = New Mexico Water Quality Control Commission
NS = not specified
Q3 = third quarter
REG = normal field sample
RSL = regional screening level
SVOC = semivolatile organic compound
Val Qual = validation qualifier
VOC = volatile organic compound
Shading = detected concentrations above the detection limit
Bold/Shading = reported concentrations exceed the NMWQCC numeric standards
Val Quals based on independent data validation:
J = Qualifier denotes the analyte was positively identified, but the associated numerical value is estimated.
U = Qualifier denotes the analyte was analyzed but not detected above the detection limit. The value associated with the U-qualifier is the LOD.
-- = Validation qualifier not assigned.

Table 5-9
Groundwater Treatment System Routine Maintenance Schedule, Q3 2020

Maintenance Activity	Frequency			
	Daily	Weekly	Monthly	As Needed
Recording and inspecting influent, GAC vessel, and effluent skid pressure, flow rate, and totalizer readings from their respective gauges and the human machine interface	X			
Recording extraction well pressure, flow rate, and totalizer readings from the human machine interface	X			
Recording extraction well pressure, flow rate, and totalizer readings from the gauges at the well vaults		X		
Inspecting well control house and recording well control house pressure, flow rate, and totalizer readings		X		
Recording totalizer reading at KAFB-7		X		
Running and inspecting the GWTS air compressor		X		
Inspecting extraction well, conveyance line, and air release valve vaults			X	
Inspecting wellhead and associated equipment of injection well KAFB-7			X	
Inspecting and performing maintenance of flowmeters throughout the system			X	
Inspecting and performing maintenance on actuating valves throughout the system			X	
Performing confined space entries			X	
Gauging extraction well filter pack			X	
Semiannual inspections and maintenance of Tijeras Arroyo Golf Course ponds				X
Logging lockout-tagout entries				X
Logging system shutdowns				X
Emptying storm water runoff flooded vaults				X
Performing air compressor maintenance				X
Cleaning GWTS sumps				X
Draining air release valve containment vessels				X
Grounds keeping including vegetation control				X
Inspecting and cleaning the GWTS Wye-strainer/basket strainer				X
Performing flow meter calibration				X[a]
Greasing pump bearings				X[b]
Changing process pump oil				X[b]
Changing air filter on control room air conditioner				X[b]
Changing bag filters				X[c]
Changing out GAC				X[c]
Disinfection of extraction wells and conveyance lines				X[d]
Testing of alarms and interlocks				X[e]
Cleaning coils and replacing air filter for the Well Control House air conditioner				X[f]
GAC skimming of the lead GAC vessel				X[g]

Table 5-9
Groundwater Treatment System Routine Maintenance Schedule, Q3 2020

[a] Flowmeters are calibrated at a minimum of once per year, but may be calibrated more often as needed.

[b] Changing of process pump oil, greasing pump bearings, and replacing the air filter in the air conditioning unit are required every 3 months, but may be changed more often as needed.

[c] Bag filters are scheduled for change out when the pressure differential across a bag filter vessel exceeds 15 psi and GAC is scheduled for change out when the pressure differential across a GAC vessel exceeds 10 psi.

[d] Disinfection of extraction wells and conveyance lines occurs semiannually or more often as needed.

[e] Testing of alarms and interlocks occurs annually or more often as needed.

[f] Cleaning of the coil and replacing of the air filter are scheduled as quarterly activities, but frequency may be adjusted as necessary.

[g] GAC skimming is performed when the differential pressure in the lead GAC vessel has increased from the operational differential pressure by at least 7 psi.

GAC = granular activated carbon
GWTS = groundwater treatment system
psi = pound per square inch
Q3 = third quarter

Table 5-10
Groundwater Treatment System Non-Routine Maintenance Items, Q3 2020

Date	Extent of Shutdown	Approximate Downtime (hours)	Cause of Shutdown
7/3/2020 - 7/15/2020	KAFB-106233	280	Train 2 influent tank level transmitter down on July 3, 2020. KAFB-106233 was shut off and all other wells were routed through Train 1. Transmitter was replaced on July 15, 2020. SN 2008661.
9/10/2020	KAFB-106239	24	Disinfected KAFB-106239

KAFB = Kirtland Air Force Base
Q3 = third quarter

APPENDICES
(Provided electronically via compact disc)

LIST OF APPENDICES

APPENDICES (CONCLUDED)

I Groundwater Treatment System Monitoring and Performance Evaluation

- I-1 Groundwater Treatment System Plant Operation and Maintenance Documentation
- I-2 New Mexico 811 Line Locate Tickets
- I-3 Groundwater Treatment System Performance Sample Collection Logs
- I-4 Data Quality Evaluation Report – Groundwater Treatment System Samples
- I-5 Data Packages – Groundwater Treatment System Samples
- I-6 Groundwater Treatment System Performance Analytical Data
- I-7 KAFB-7 Maintenance Report

J Waste Disposal Documentation

- J-1 Non-Hazardous Liquid Investigation-Derived Waste Profiling and Disposal Documentation
- J-2 Non-Hazardous Solid Investigation-Derived Waste Profiling and Disposal Documentation
- J-3 Hazardous Investigation-Derived Waste Profiling and Disposal Documentation

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Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

July 11, 2019

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil engineer Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: **QUARTERLY MONITORING REPORT FOR APRIL-JUNE 2019**
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNITS ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-19-017

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of the Kirtland Air Force Base (Permittee) *Quarterly Monitoring Report for April-June 2019, Bulk Fuels Facility, Solid Waste Management Unit ST-106/SS-11* (Report), dated September 2019 and received September 27, 2019.

No revision to the Report is required. NMED's attached comments are intended to provide direction to the Permittee in the preparation of future quarterly monitoring reports. Necessary changes based upon NMED's comments should be incorporated into future reports. The Permittee must ensure that future monitoring reports fully comply with Kirtland Air Force Base KAFB) Hazardous Waste Facility Permit (Permit) Section 6.1.6. Quarterly Progress Reports, Section 6.2.4.1. Quarterly Reporting, and Section 6.2.4.4. Periodic Monitoring Reports. Additional guidance on preparing groundwater monitoring reports can be found in NMED's *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites.*

Should you have any questions please Rob Murphy of my staff at robert.murphy@state.nm.us or (505) 476-6022.

Sincerely,

Kevin Pierard

Digitally signed by Kevin Pierard
Date: 2020.07.11 08:25:15 -06'00'

Kevin M. Pierard, Chief
Hazardous Waste Bureau

Attachments I

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
L. Andress, NMED HWB
R. Murphy, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Clark, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

Attachment

Col. Miller and Lt. Acosta
Quarterly Monitoring Report for April-June 2019
Attachment, Page 1 of 4

GENERAL COMMENTS:

1. Monitoring Report Contents

NMED Comment:

Based on issues identified in this Report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable:

a. The response to NMED's comments must be included as Appendix A of each document revision.
b. All field methods for the project must be documented in an appendix, as required by Permit Section 6.2.4.4.11. The documentation must be specific to each monitoring activity, such as soil vapor monitoring, groundwater monitoring, or operation and maintenance of the groundwater treatment system. References to quality assurance project plans (QAPPs), standard operating procedures (SOPs), or work plans are not acceptable. All deviations from approved work plans must be discussed and explained in a Deviations section.
c. Wells must be consistently referred to by the same name/designation in all periodic reports, sections of the text, tables, and figures. The designations must match those provided in the digital analytical data files.
d. Sampling data tables must include the practical quantitation limit (PQL) and listed laboratory report detection limit (RDL) for each analysis.
e. Sampling data tables must include the appropriate screening levels for data comparison.
f. Analytical data tables in digital format must include a column that indicates which analytical data report the specific sample information can be found. This link must correspond to the analytical data report file name.
g. Data quality exceptions, such as when the PQL exceeds the corresponding screening level, must be identified as such in all tables and figures (see Permit Section 6.5.18).
h. Analytical data provided in digital format such as Microsoft Excel or Access files must be provided in a sortable, searchable format. Previous reports have provided digital data in the same format as the printed tables. These tables are not sortable or searchable. Provide the tables in a standard database format.
i. Analytical data packages must be submitted in accordance with KAFB Permit Section 6.5.18.2, Laboratory Deliverables.
j. All tables, figures, and appendices must be appropriately numbered and titled.
k. Every page of every submittal, including all pages within all sections and appendices, must be numbered either sequentially or in some other format acceptable to NMED.

2. Analytical Data Detection and Quantitation Limits

NMED Comment: Many of the analytical data tables presented in the Report list the limit of detection (LOD) for each sample analysis; however, it is not clear if this value represents the laboratory method detection limit or reporting detection limit. Some tables list the LOD and some the limit of quantification (LOQ). The permittee must provide the method detection limit (MDL) in the data tables. In addition, the Permittee must include the reporting detection limit (assuming this is the Permittee's "LOD") and the PQL (assuming this is the Permittee's "LOQ") for each sample analyzed in the data tables.

The Permittee's Quality Assurance Project Plans (QAPPs) indicate that the Permittee is using three different variations of terminology for method reporting limits, including one which seems to be backwards. The Permittee's QAPP for Vadose Zone Treatability Studies Attachment 1, Tables 1-1a, Method Reporting Limits – Drinking Water, 1-1b, Method Report Limits – Soil and Investigation Derived Waste, and 1-1c, Method Reporting Limits – Volatile Organic Compounds in Air, all seemingly use LOQ appropriately (as the PQL), but there is a lack of consistency between the method detection limit and reporting detection limit.

In Table 1-1a, Drinking Water, "MDL" appears to equate to the method detection limit, and "LOD" appears to equate to the reporting detection limit. In Table 1-1b, Soil, "LOD" appears to equate to the method detection limit and "DL" appears to equate to the reporting detection limit. In Table 1-1c, Air, "DL" appears to equate to the method detection limit and "LOD" appears to equate to the reporting detection limit. Based on the fact that the PQL must be greater than the reporting detection limit and the reporting detection limit must be greater than the method detection limit, Table 1-1b, Soil, appears to be wrong. NMED is assuming that similar tables appear in the QAPP for quarterly monitoring.

These issues cause confusion for the reviewer, community stakeholders, and the public, and increases the time required to review submittals from the Permittee. The Permittee must use appropriate and consistent terms for Quality Assurance /Quality Control in all periodic reporting submittals and for all media (e.g., use MDL consistently instead of DL). While NMED does not review or approve QAPPs, the Permittee must assure that they are providing their contractors with the appropriate information to provide appropriate, consistent, and accurate information to NMED. Consistency in reporting by the Permittee will reduce both agency and Air Force internal review times.

SPECIFIC COMMENTS:

3. Table of Contents, Appendix B, page iv:

NMED Comment: Appendix B, New Activities Supporting Information, contains well completion reports for four new wells installed and developed in accordance with the NMED-approved 2017 *Work Plan for Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling.* KAFB Permit Section 6.2.2.1.2, Site Investigations-Investigation Reports, and Section 6.2.4.3, Reporting Requirements-Investigation Reports, require that the information and data collected from all investigation activities conducted during the quarter be submitted to NMED as separate, stand-alone reports. The Permittee must submit individual reports for all investigation activities conducted in support of the ongoing investigation of the bulk fuels facility spill, rather than submit the information as appendices in quarterly reports.

4. **Section 2.5 Q2 2019 Soil Vapor Data, page 2-4:**

Permittee Statement: "The RCRA permit does not specify cleanup levels for soil vapor. The quarterly reports are not intended to assess risk; the vapor data are used to assess concentration trends. The risk assessment (USACE,2017e) compares vapor concentrations to the vapor intrusion screening levels in the NMED Risk Assessment Guidance for Site Investigations and Remediation. All EDB and benzene concentrations are compared against 3,800 and 3,200 micrograms per cubic meter (µg/m3), respectively. HC concentrations are compared against 1,000 parts per million by volume (ppmv). The comparison concentrations used in this report were determined by historical maximum and minimum soil vapor results to show which SVMPs had relatively high or low concentrations."

NMED Comment: The Permittee must clarify if the comparison values for EDB, benzene, and HC represent the historical maximum or minimum, or some other calculated value so that changes relative to the values can be evaluated. The Permittee must also provide a reference for the historical soil vapor values. The Permittee accurately states that quarterly reports are not intended to assess risk; however, the Permittee must provide a comparison of detected concentrations to a regulatory standard for the purpose of assessing the presence and location of contaminants of concern. NMED's *Risk Assessment Guidance for Site Investigations and Remediation* (2019 and as updated) vapor intrusion screening levels (VISLs) must be used as a first-tier screening assessment.

5. **Section 2.2 Bioventing Pilot Test, page 2-2:**

Permittee Statement: "A bioventing report will be submitted on January 31, 2020 as requested by NMED in a letter dated February 25, 2019 (NMED, 2019). This report will include data collected up to Q4 2019. Data collected after Q4 2019 will be provided in the relevant quarterly monitoring reports. The Q4 2020 Quarterly and Annual Monitoring Report will include results to date, and the final results of the bioventing pilot test will be provided in the Q4 2021 Quarterly and Annual Monitoring Report."

NMED Comment: Bioventing pilot test data is collected each quarter; therefore, the Permittee must provide quarterly data updates in separate quarterly status reports specific to the bioventing pilot study to allow NMED to provide timely adjustment and inputs to the bioventing system. The final results of the bioventing pilot test must be submitted as a stand-alone document rather than as an appendix to the Q4 2021 Quarterly and Annual

Monitoring Report.

6. **Section 3.3.1 Sampling Deviations, page 3-3:**

   Permittee Statement: "Groundwater samples were not obtained from seven wells in Q2 2019. Three wells (KAFB-106001, KAFB-106008, and KABF-106079) could not be sampled due to suspected biofouling. These wells will be sampled using passive sampling techniques in the future after well rehabilitation is evaluated."

   NMED Comment: The Permittee must provide additional information in a subsequent quarterly report on suspected biofouling of wells KAFB-106001, KAFB-106008, and KABF-106079, such as evidence for biofouling, the source of biofouling, and the date when biofouling was first suspected. Well KABF-106079 is less than 1000ft from interim measure extraction well KAFB-106239. Provide information on the potential for suspected biofouling at KAFB-106079 to impact KAFB-106239 and the Groundwater Treatment System. The Permittee must also submit a work plan for evaluating and conducting rehabilitation of the three wells. Use of passive sampling techniques for wells KAFB-106001 and KABF-106079 is contingent upon NMED approval. Because LNAPL was previously detected in well KAFB-106008, use of passive sampling is not appropriate.

7. **Section 3.6.1.1 EDB Analytical Results, page 3-5:**

   Permittee Statement: *Five EDB exceedances were from wells north of Ridgecrest Drive SE but none were north of Gibson Boulevard SE.*

   NMED Comment: Figures 3-5 and 3-6 present EDB concentrations in groundwater for reference elevation 4857 and 4838, respectively. Both figures depict the northern extent of the EDB plume as being north of Gibson Boulevard SE. The Permittee must revise the statement and figures for accuracy if they are included in future periodic reports.

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

July 14, 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil engineer Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: APPROVAL WITH MODIFICATIONS
WORK PLAN FOR DATA GAP MONITORING WELL INSTALLATION
KAFB-106248 to KAFB-106252
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-19-015

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of the Kirtland Air Force Base (Permittee or KAFB) *Work Plan for Data Gap Monitoring Well Installation KAFB-106248 to KAFB-106252* (Work Plan), dated December 2019. NMED has reviewed the Work Plan and hereby issues this Approval with Modifications.

The attached comments include direction to expedite the characterization of the source area contaminant migration pathway, correct deficiencies in the Work Plan, and provide specific information regarding the sampling of newly installed groundwater monitoring wells. NMED comments are presented in Attachments I and II. NMED and KAFB staff met on May 28, 2020 to discuss relocating one or two of the wells closer to the source area, the associated changes to the scope of the project, and additional NMED comments and questions. NMED sent a list to KAFB describing the changes in scope of work via electronic mail on June 1, 2020.

Please submit replacement pages and proposed borehole locations to NMED no later than **September 15, 2020**. The Permittee shall ensure that all copies of the Work Plan are updated with the NMED-approved replacement pages and that contractors are issued copies of the updated Work Plan so that investigation activities are conducted according to the modified scope provided in this Approval with Modifications letter. The Permittee is advised that if field work is not performed appropriately due to incorrect direction given to field staff, it may result in the Permittee being required to repeat or conduct additional work.

Please submit an investigation report summarizing the results of the implementation of this Work Plan no later than **June 15, 2021**. The report must address all of the comments included in this Approval with Modifications. The report must be submitted to NMED in the form of two hard copies and one electronic copy.

This approval is based on the information presented in the document as it relates to the objectives of the work identified by NMED at the time of review. Approval of this document does not constitute agreement with all information, or every statement presented in the document.

Should you have any questions or wish to meet with us to discuss these comments, please contact me at (505) 476-6035.

Sincerely,

for

Kevin M. Pierard, Chief
Hazardous Waste Bureau

Attachments I and II

cc: S. Stringer, Director NMED RPD
D. Cobrain, NMED HWB
B. Wear, NMED HWB
R. Murphy, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

Attachment I

Col. Miller and Lt. Col. Acosta
July 14, 2020
Attachment I, Page 1 of 15

APPROVAL WITH MODIFICATIONS COMMENTS:

1. **Address contaminant migration pathway data gaps beneath the source area.**

   NMED Comment: Data gaps remain from the source zone characterization previously performed under the Permittee's *Work Plan for Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling Bulk Fuels Facility, Solid Waste Management Unit (SWMU) ST-106/SS-111, Kirtland Air Force Base, New Mexico, Revision R1*, dated December 2017 and approved with conditions by NMED on February 23, 2018. The results of the investigation were presented in the *Source Zone Characterization Report for the Bulk Fuels Facility Solid Waste Management Unit ST-106/SS-111*, received by NMED on October 30, 2019. This Report is currently under NMED review. The review in progress indicates that that the migration pathway has not been adequately characterized beneath the source area.

   In order to understand the migration of contaminants through the vadose zone beneath the former fuel offloading rack (FFOR), an understanding of the stratigraphy approximately 250-300 feet below ground surface (ft bgs) is essential. The source area contaminants descend essentially vertically from the surface to a depth of approximately 250-350 ft bgs where a distinct clay layer is present. The clay layer is easily identified in drill cores and on geophysical logs. The thickness, lateral continuity, and geometry of this clay layer changes across the site. Directly below the FFOR the clay occurs as a single layer at approximately 275-300 ft bgs (lower clay). East-southeast of the FFOR the clay occurs as a single layer at approximately 250 ft bgs (upper clay). A vertical offset can be identified in the clay layer directly below the FFOR that likely creates a preferential pathway to vertical migration of contaminants. Once contaminants reach the 250-300 foot depth range they appear to migrate predominantly downdip (to the east-southeast) on the lower clay layer and then generally vertically to the water table. Three other data sets support this interpretation of the contaminant migration pathway: the observed lateral offset of elevated volatile organic compound (VOC) concentrations with depth; soil vapor extraction system rebound data; and Pneulog total volatile petroleum hydrocarbons (TVPH) soil gas data. All three data sets show contaminant migration to be predominantly vertical beneath the FFOR to a depth in the 250-300 foot range with a shift in the pathway to the east-southeast before continuing on a vertical downward path to the water table.

   As stated in NMED's November 4, 2019 letter, "NMED met with the Permittee on September 26, 2019 to discuss the potential to utilize some of the proposed wells for multiple purposes to address other data gaps, the most important being the further characterization of the source area migration pathway through the vadose zone east of the former location of the bulk fuels loading racks. The Permittee agreed to evaluate the potential..." Therefore, the Permittee is instructed to relocate one or two of the proposed monitoring wells (KAFB-106250 and KAFB-106251) nearer to source area, as shown in Attachment II.

In order to reduce cost and accelerate work, borehole(s) may be drilled with air rotary casing hammer techniques (ARCH) to a depth of approximately 230 ft bgs, just above the top of the clay described above. The boreholes must then be continuously cored to the total depth of the borehole and sampled for total petroleum hydrocarbons (TPH) gasoline range organics (GRO) and diesel range organics (DRO) Extended using United States Environmental Protection Agency (EPA) Method 8015 (modified). The total depth must be 10 feet below any field screening evidence of contamination (e.g., photoionization detector (PID) readings greater than 10 parts per million volume (ppmv)) to obtain a consistent detailed vertical profile of the migration pathway and to determine the vertical extent of contamination in the source area. A sample for TPH GRO and DRO Extended must be collected at the total depth of the borehole(s). The borehole(s) must also be geophysically logged. See Attachment II for NMED's proposed location for source area migration pathway boreholes.

The Permittee must provide NMED email notification at certain stages of the drilling process. These stages include but may not be limited to:

a) initiation and cessation of ARCH drilling,
b) initiation of sonic drilling,
c) upon reaching a depth of 300 ft bgs,
d) upon reaching the water table, and
e) upon reaching total well depth.

The Permittee's notification to NMED that the driller has reached a depth of 300 ft bgs must include the actual depth bgs and thickness of the clay layer, if it is encountered. If the clay layer is not encountered then the objective of the well will have been achieved, that is, to identify the possible gap in the clay layer located 250 and 300 ft bgs as described above.

If the clay layer is encountered, the Permittee, in consultation with NMED, must make a determination about whether it is the lower or upper clay. If it is determined that the driller has encountered the lower clay, the driller should stop at 300 ft bgs or just below the bottom of the clay and the Permittee must partially backfill the borehole with a bentonite seal and sand. The bentonite must be emplaced with a tremie pipe to approximately 2 ft below the top of the clay followed by one foot of sand to prevent bentonite from entering the well screen. The borehole must then be completed as a soil vapor monitoring well (SVMW) with the lower end of the screen located across the top of the clay layer. The SVMW must be constructed with a 1 foot sump and a 2 foot screen of an appropriate slot size. A SVMW design must be submitted to NMED for review with the Work Plan replacement pages.

If it is determined that the driller has encountered the upper clay only, the driller should advance the borehole to total depth below the water table and the Permittee must complete the well as a dual screen ground water monitoring well as proposed in the Work Plan.

If the first borehole is not successful in locating the contamination migration pathway (i.e., lower clay has been encountered) then a second borehole location should be selected based on the findings of the first borehole. The proposed second borehole location must be submitted by the Permittee to NMED for approval via electronic mail and approved prior to initiation of drilling.

If the first borehole is successful in locating the contamination migration pathway then the Permittee, in consultation with NMED, must make a determination if a second borehole location should be selected to refine the migration pathway or if the borehole should be used to meet the objectives outlined in the Work Plan. See comments below for further detail.

Upon completion of drilling the first borehole in the source area, the Permittee must provide NMED a copy of the lithologic log(s) by email. After reviewing the lithologic logs, NMED will provide direction for well installation at that location and direction on drilling a second borehole in the source area.

NMED may require the installation of additional groundwater monitoring wells, if the five wells installed pursuant to this Work Plan do not sufficiently address the data gaps.

2. **Section 6.0 Monitoring and Sampling, page 6-1, line 28**

Permittee Statement: "Beginning in 2016 passive sampling techniques were implemented at select GWM [ground water monitoring] well locations. The transition to passive sampling for select GWM well locations was formally approved by NMED on May 31, 2017 (NMED, 2017. A further passive sampling evaluation was performed in Q4 2017 (Section 3.7.7 of KAFB, 2018b). This evaluation demonstrated that analytical results from passive sampling techniques and analytical results from low-flow sampling techniques are generally comparable between the two sampling methods, with no consistent bias identified (i.e., neither method has consistently resulted in higher or lower concentrations)."

NMED Comment: NMED's May 31, 2017 approval letter approved the change to the use of passive diffusion bags and dual membrane samplers for certain groundwater monitoring wells located north of Ridgecrest Drive in residential areas. NMED did not approve the use of passive sampling south of Ridgecrest Drive, particularly in areas with elevated petroleum hydrocarbon contamination. The passive sampling demonstration evaluation performed in Q4 [fourth quarter] 2017 and presented in the *Quarterly Monitoring Report October-December 2017 and Annual Report for 2017*, dated March 2018, was not reviewed or approved by NMED Hazardous Waste Bureau (HWB).

The *Quarterly Monitoring Report-October-December 2018 and Annual Report for 2018*, dated March 2019, states "Field parameters [i.e., turbidity, temperature, dissolved oxygen, specific conductivity, pH, and oxidation reduction potential] were not collected from wells that were sampled using passive sampling methods due to the unreliable field parameter data associated with this technology."

Additionally, an email to NMED from KAFB, dated February 28, 2020, provided data from this evaluation. The data indicates that source area monitoring well KAFB-106053 does not produce "high quality and representative sampling that was highly comparable to low-flow sampling," as indicated in the text of the email. Low-flow sampling results indicated a benzene concentration of 15,000 μg/L with duplicate results of 16,000 μg/L, while the passive sampling results for this same well indicated a benzene concentration of 3,700 μg/L with duplicate results of 3,600 μg/L. This demonstrates an order of magnitude difference between the sampling methods for this well located in the source area.

3. **Section 4.0, Scope of Activities, page 4-1**

   NMED Comment: The Permittee must revise Section 4.0 of the Work Plan along with corresponding Figures and Tables to incorporate the modifications required by NMED to characterize the source area migration pathway. See individual comments on Section 4.0 revisions below. The Permittee must submit the revised Section 4.0 and corresponding Figures and Tables as replacement pages.

4. **Section 4.0, Scope of Activities, page 4-1, line 6**

   Permittee Statement: "...well locations proposed in this Work Plan are shown on Figure 2-1 and Figure 2-2."

   NMED Comment: The Permittee must relocate one or two of the proposed monitoring wells (KAFB-106250 and KAFB-106251) to locations in the source area to determine the source area migration pathway. Propose two new locations within the area identified in Attachment 2. Include a primary location to be drilled first and a secondary location to be drilled should the first borehole not successfully locate the migration pathway.

5. **Section 4.0, Scope of Activities, page 4-1, line 9 and Figure 4-1, Proposed Construction Diagram for Groundwater Monitoring Well with Contingency Well and Figure 4-2, Proposed Construction Diagram for Groundwater Monitoring Well KAFB-10624**

   Permittee Statement: "Four of the five proposed GWM wells (KAFB-106249 through KAFB-106252) will be constructed with the same design employed by the Work Plan for Data Gap Monitoring Well Installation (Section 3.1.1 of [Work Plan for Data Gap Well Installation, 2017]) as shown on the construction diagram (Figure 4-1)."

   NMED Comment: All groundwater monitoring wells must be constructed utilizing an appropriate well casing diameter (e.g., four-inch inside diameter) to accommodate equipment, such as low-flow pumps, which can effectively purge wells for active sampling.

6. Section 4.0, Scope of Activities, page 4-2, lines 1 through 16

Permittee Statement: "KAFB-106250 is proposed to be installed in the parking lot of the Air National Guard (ANG) adjacent to the existing well KAFB-106046. This location will help to bound both the EDB [ethylene dibromide] and benzene plumes in this area...KAFB-106251 is also proposed for installation on ANG property, adjacent to the boundary with the BFF [Bulk Fuels Facility]... However, water table wells are needed closer to the source area to more accurately delineate the EDB and benzene plumes in this area."

NMED Comment: According to Figures 2-1, Proposed Monitoring Well Locations and Q2 [second quarter] 2019 EDB Plume Map, and Figure 2-2, Proposed Monitoring Well Locations and Q2 2019 Benzene Plume Map, wells KAFB-106245 and KAFB-106247 do not have submerged well screens and neither EDB nor benzene were detected in the second quarter of 2019 (Q2 2019). These wells provide delineation of the plumes to the east and east-southeast of the source area; therefore, proposed wells KAFB-106250 and KAFB-106251 are good candidates to be moved to characterize the source area migration pathway.

7. Section 5.0, Scope of Activities, page 4-1

NMED Comment: Please revise Section 5.0 of the Work Plan along with corresponding Figures and Tables to incorporate the modifications required by NMED to characterize the source area migration pathway. See individual comments on Section 5.0 revisions below. The Permittee must submit the revised Section 5.0 and corresponding Figures and Tables as replacement pages.

8. Section 5.0, Scope of Activities, page 4-1

NMED Comment: The Permittee must incorporate / reference the relevant scopes of work from the *Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling Bulk Fuels Facility, Solid Waste Management Unit (SWMU) ST-106/SS-111, Kirtland Air Force Base, New Mexico, Revision R1,* dated December 2017, and approved with conditions by NMED on February 23, 2018 (VZ Work Plan), including, but not limited to, the following:

a) Drilling Approach and Methodology as outlined in Section 3.1.1.1, page 3-2 of the VZ Work Plan: "....borings can be cored continuously from ground surface to total depth, these borings will be over-reamed via air rotary casing hammer (ARCH) technique to the nominal 10-inch diameter OR borings can be accomplished using a combination of ARCH drilling to the designated coring depth, followed by sonic drilling [or other continuous core methodology] to obtain undisturbed cores from the designated coring intervals. Upon achieving the top of the designated coring interval depth, the ARCH rig will be moved off each location while leaving the casing downhole, and the sonic [or other continuous core] rigs will be positioned at the cased holes to core the prescribed designated coring intervals and then subsequently reamed with a sufficient size bit with the ARCH drilling rig to provide a large enough borehole for well construction."

b) Core temperatures must be monitored as outlined on page 3-2 in Section 3.1.1.1, page 3-2 of the VZ Work Plan: "Heating during continuous core collection can impact contaminant, geochemical and microbial properties and adversely affect sample representativeness. In addition to advancing the borehole to the designated coring depth with the ARCH rig, to minimize the heating potential, heating of the sonic drilling core barrels in the unsaturated zone can be controlled by any one or combination of the following:
   i. Advancing shorter sampling runs (5-10 feet versus 20 feet)
   ii. Allowing the core barrel to cool (or pre-cooling the core barrel) before tripping back into the borehole
   iii. Changing the vibration level and rotation speed
   iv. Injecting small quantities of potable water between the override casing and the core barrel without compromising sample integrity as described in ASTM International D6914/D6914M-16.
   v. Temperature inside the core will be monitored when returned to the surface to ensure that heating of the core barrel is not impacting sample selection or integrity. Background soil vapor temperatures in the vadose zone have historically averaged from 20 to 22 degrees Celsius (°C). Average groundwater temperatures at the site are 19°C. Any core heating over 20°C will require mitigation steps as outlined above. If water is injected, the bottom few inches of the core intervals that are possibly in contact with water accumulating in the bottom of borehole will be discarded prior to collection of samples. Sonic core barrels in the saturated zone are naturally cooled by the presence of formation water; however, similar steps will be implemented as described above to ensure sample representativeness."

c) Field Screening for hydrocarbons must be conducted as outlined in Section 3.1.1.3, page 3-3 of the VZ WP, with depths modified as follows: When advancing the borehole to the designated coring interval with ARCH, all cuttings must be logged and PID measurements collected at a minimum of every 10 feet as described in Section 3.2.10 of the VZ WP. Within the designated coring interval, PID readings must be collected every 5 ft. Additional measurements will be collected if qualitative data (e.g., staining, odor, etc.) indicate possible LNAPL. All PID readings shall be recorded on borehole logs.

d) Laboratory Analyses for Selected Core Samples as outlined in Section 3.1.1.4, page 3-4 of the VZ WP, and modified as follows: Samples for laboratory analyses shall be collected every 10 ft, additional samples shall be selected based on elevated PID measurements (augmented by lithologic and qualitative data) and sampled for TPH GRO/DRO Extended by EPA Method 8015 (modified) from 230 ft bgs to the total depth of the boring(s), to obtain a consistent detailed vertical profile of the migration pathway.

9. Section 5.1.2 Drilling of Groundwater Monitoring Wells, page 5-2, line 2

Permittee Statement: "All five new monitoring nested wells will be installed via air rotary casing hammer technology with casing advancement."

NMED Comment: The two designated boreholes to be used for the investigation of the source area migration pathway must be continuously cored from 230 ft bgs to total depth. This will provide undisturbed cores for more accurate lithologic logging, field screening, and soil sampling. This can be accomplished using a combination of ARCH drilling to the designated coring depth, followed by sonic or other continuous core drilling method to obtain undisturbed cores from the designated coring intervals.

10. Section 5.1.2.2 Photoionization Detector [PID] and Headspace Screening, page 5-2, line 32

Permittee Statement: "PIDs will be used for breathing zone monitoring during drilling and sampling activities, as well as for field screening of hydrocarbons in soil cuttings during drilling. This instrument monitors volatile organic compounds using a PID with a 9.8-electronvolt (eV), 10.6-eV, or 11.7-eV UV lamp."

NMED Comment: The Permittee must use either a 9.5 eV or 9.8 eV UV lamp for field screening samples to avoid fouling of the lamp due to dust, moisture, or high concentrations of petroleum vapors. If evidence of lamp fouling is observed during use of a PID with a 9.8 eV lamp, the Permittee must switch to a 9.5 eV UV lamp to obtain the most accurate PID readings possible. The Permittee must have an additional PID with the lower lamp strength readily available. Reliable PID readings will result in a consistent detailed vertical profile of the migration pathway. Failure to obtain reliable readings in the potential migration pathway may result in having to drill another boring to obtain accurate readings.

11. Section 5.1.2.2 Photoionization Detector and Headspace Screening, page 5-2, line 37

Permittee Statement: "Record PID measurements at a minimum of every 25 ft of drill cuttings down to 450-ft depth, and then every 10 ft of drill cuttings to total depth following the process below..."

NMED Comment: For boreholes that will be continuously cored, the Permittee must record PID sample measurement, at a minimum, every 10 ft from ground surface to the start of coring and every 5 ft from the start of coring to the total depth of the borehole to obtain a detailed vertical profile of the migration pathway.

12. Section 5.1.3 Construction of Groundwater Monitoring Wells, page5-3, line 21

Permittee Statement: "The GWM nested wells will each be constructed using 3-inch diameter Schedule 80 polyvinyl chloride (PVC) casing..."

NMED Comment: The Permittee must construct all wells with well casing of sufficient diameter such that they can be sampled via active sampling techniques (e.g.: four-inch inside diameter well casing to accommodate pumps). See also Comment 5.

13. Geophysical logging of source area boreholes

NMED Comment: The Permittee must add a section to the Work Plan proposing to geophysically log all source area migration pathway investigation bore holes with a dual induction geophysical logging tool. The Permittee must specify approximate depths of interrogation for the tool they propose to use. The tool must be calibrated and operated according to American Society for Testing and Materials (ASTM) standards for geophysical logging and the operation manual for the specific model of logging tool. In the report summarizing the results of the investigation the Permittee must provide shop calibration and daily field calibration data. An electronic copy of raw and processed data must be provided in Excel table format. A visual presentation of the log curve must be presented on a single page in a continuous format rather than as several separate pages. The geophysical log(s) for each well must be displayed with the lithologic log for comparison purposes and a discussion of the results must be included in the main body of the investigation report. Wells that are to be or will be geophysically logged must be designed with PVC centralizers rather than steel centralizers.

14. Section 5.1.3.2 Well Development, page 5-4

NMED Comment:
The Permittee must measure and record the parameters for pH, temperature, conductivity, and turbidity, as shown on the field form presented in Appendix B, Field Forms.

The Permittee must collect groundwater samples within 10 days after well development in accordance with Section 6.5.17.3 of the Permit. Samples must be analyzed in accordance with Table 6-1, Groundwater Monitoring Requirements for Data Gap Wells.

15. Section 5.1.3.2 Well Development, page 5-4, line 34

Permittee Statement: "The new wells (KAFB-106248 through KAFB-106252) were designed for passive sampling (Section 6), and the 0.010-inch slot size should minimize formation fines in these wells."

NMED Comment: The new wells must be designed for active sampling techniques. The new wells must be sampled using active sampling (e.g., low-flow sampling) for a minimum of eight consecutive quarters to establish baseline concentrations in order to establish the precision criteria for passive sampling methods for the newly installed wells. While the approved work plans for data gap well installation and vadose zone coring included passive sampling of newly installed wells, the NMED administrative record does not contain documentation that the use of passive sampling south of Ridgecrest Drive, particularly in areas of elevated contaminant concentrations, has been evaluated or approved by NMED.

16. Section 6.0 Monitoring and Sampling, page 6-1

NMED Comment: The Permittee must revise Section 6.0 of the Work Plan along with corresponding figures and tables to incorporate the modifications required by NMED to characterize the source area migration pathway. See individual comments on Section 6.0 revisions below. The Permittee must submit the revised Section 6.0 and corresponding figures and tables as replacement pages.

17. Section 6.0 Monitoring and Sampling, page 6-1, line 11

Permittee Statement: "All newly installed wells will be sampled for four consecutive quarters to establish baseline concentrations for the parameters listed in Table 6-1."

NMED Comment: The Permittee must collect groundwater samples from all newly installed wells within 10 days after well development in accordance with Section 6.5.17.3 of the Permit, at the next quarterly sampling event, and quarterly thereafter for eight consecutive quarters via active sampling methods (e.g., low-flow) to establish baseline concentrations. These data will be used to establish precision criteria for passive sampling methods for the newly installed wells. Groundwater samples must be analyzed for analytes presented in Table 6-1, Groundwater Monitoring Sampling Requirements for Data Gap Wells, of the Work Plan.

18. Section 6.0 Monitoring and Sampling, page 6-1, line 35

Permittee Statement: "Groundwater sampling will be performed via passive sampling techniques for all new GWM wells covered in this Work Plan, barring any environmental factors that would preclude the ability to sample with this technology (e.g., significant and continuous LNAPL thickness in the well)."

NMED Comment: Given the concerns stated above, the Permittee must not use passive sampling in areas with elevated petroleum hydrocarbon contamination (i.e., in the vicinity of the source area).

19. Section 6.2 Preparation for Groundwater Well Sampling, page 6-3, line 2

Permittee Statement: "All wells covered in this Work Plan will be sampled via passive sampling technology and, therefore, well purging will not be required in association with sampling"

NMED Comment: The Permittee must add active sampling (e.g., low-flow) to relevant portions of Section 6.0. See the preceding comments regarding passive sampling.

20. Section 6.2.1 Collection of Groundwater Samples from Monitoring Wells Using Passive Sampling Techniques, page 6-3, line 19

Permittee Statement: "The procedures below will be followed for passive sampling."

NMED Comment: As stated previously, active sampling techniques are required. Please include a section describing the procedures for active sampling in the modified Section 6.0 replacement pages and remove the description for passive sampling.

21. Section 6.3 Analytical Requirements and Quality Control, page 6-4, line 31

NMED Comment: The Permittee must revise Section 6.3 of the Work Plan along with the relevant figures and tables to include the additional sampling required for the modified scopes of work in the modified Section 6.0 replacement pages.

22. Section 6.3 Analytical Requirements and Quality Control, page 6-4, line 31

NMED Comment: The Permittee must include a data validation section of the Report which describes the data validation process outlined in this Section 6.3 of the Work Plan. Data validation shall be conducted in accordance with Permit Section 6.5.18.

23. Section 6.5.2 Hazardous Water Investigation-Derived Waste, page 6-6, line 30

Permittee Statement: "No hazardous/potentially hazardous [investigation-derived waste] IDW is anticipated to be generated from the activities outlined in this Work Plan."

NMED Comment: This statement must be revised in the modified Section 6.0 replacement pages. The modified scope of work requires drilling and well development activities in the source area which may generate potentially hazardous IDW. Provide a description of the proposed management of hazardous IDW. Alternately, propose to dispose of purge / development water in the on-site groundwater treatment system that treats groundwater removed from recovery wells located north of Ridgecrest Drive.

24. Section 7 Project Schedule, page 7-1, line 1

NMED Comment: The Permittee must revise Section 7.0 of the Work Plan along with corresponding figures and tables to incorporate the modifications required by NMED to characterize the source area migration pathway. See individual comments on Section 7.0 revisions below. The Permittee must submit the revised Section 7.0 section as replacement pages.

25. Table 6-1, Groundwater Monitoring Sampling Requirements for Data Gap Wells

NMED Comment: Baseline sampling of newly installed wells must include quarterly sampling for GRO, DRO, and volatile organic compounds. The sampling frequency and analytical suite will be re-evaluated after the initial post-development sampling plus eight quarters of baseline sampling.

26. Table 6-3, Summary of Investigation-Derived Waste Sampling

NMED Comment: Under the portion of the table titled "Water Investigation-Derived Waste from Drilling", the Permittee indicates that post development water will be characterized by a sample taken from "the bailer at end of development". The Permittee is directed to take a composite sample of water from all containers of development water from each well. The contaminant concentrations in the development water may be higher or lower at the start of well development than at the end of development. A composite sample will provide a more accurate representation of contaminant concentrations in the IDW.

27. Appendix B, Field Forms

NMED Comment: The Borehole/Well Construction Log must include well details for all wells to be installed in a single borehole. The example field form shows only one well while the scope of work proposes two wells per borehole. The field form must include well details for installing two wells in each borehole.

28. Appendix C, Eurofins Lancaster Laboratories Environmental [Limited Liability Company] LLC Method Reporting Limits and Screening Criteria

NMED Comment: The Permittee must add a table which presents relevant Method Reporting Limits for soil analyses for the modified scope of work outlined in this Approval with Modifications letter.

29. Appendix C, Eurofins Lancaster Laboratories Environmental LLC Method Reporting Limits and Screening Criteria

NMED Comment: The Permittee must ensure that the limit of quantitation (LOQ) is less than the project screening levels. If this cannot be achieved by the laboratory due to the dilution of samples or other reason, the new LOQ, and all data qualifiers must be reported. Data tables in the investigation report must present the final limit of detection (LOD), LOQ, sample results, and all laboratory data qualifiers for the analytical results. No revision to Work Plan required.

SPECIFIC COMMENTS:

30. Section 2.1, Background Information, page 2-1, line 5

NMED Comment: The Permittee must include a more complete site history in the investigation report. The background information / site history must include a comprehensive summary of the subsurface field investigations that have contributed to the understanding of the site conceptual model and hydrogeology. The Report must also include a more detailed discussion of current water use and the influence of water supply wells on the hydrology and dissolved phase contaminant migration at the site. Discuss the impact these factors may have on projected future use of the water supply wells.

31. Section 2, Background Information, page 2-1, line 34

Permittee Statement: "Appendix A-1...illustrates groundwater elevations from 2011 through 2018 along two transects through the [ethylene dibromide] EDB plume. These time series graphs illustrate that the most pronounced increases in groundwater elevation are in the northern area of the site."

NMED Comment: Appendix A-1, Water Level Hydrographs, does not clearly illustrate this. It is difficult to ascertain trends with the bar graphs presented. Significant differences between the southern and northern portions of the site are not readily apparent. In future documents the Permittee must present data trends in an easy to interpret format. In addition, on Figure L-2-1, Groundwater Elevation Cross Section, three drinking water supply wells are shown on the figure but are not identified in the legend. Other figures had to be consulted to identify these wells. In future documents the Permittee must include all pertinent symbols in the legends of figures. No revision is necessary.

32. Section 2, Background Information, page 2-1, line 45 and page 2-2, line1

Permittee Statement: "Appendix A-1 includes compiled potentiometric surface maps, EDB plume maps, and benzene plume maps at the 4,857 reference elevation interval (REI)..."

NMED Comment: In the investigation report the Permittee must add a brief explanation of REI's at the site including the depth intervals they represent in both words and numbers (e.g., "the 4,857 REI represents wells screened in the shallow zone at depths ranging from approximately X ft bgs to X ft bgs.") and include a figure / table for visual clarification of this term.

33. Section 2.2, Initial Data Gap Groundwater Wells and Vadose Zone Coring Activities, page 2-2, line 38

Permittee Statement: "The Source Zone Characterization Report...describes the complete suite of analyses performed to characterize LNAPL in the soil cores. The report also describes the conclusions of the LNAPL analyses."

NMED Comment: The Source Zone Characterization Report is currently in review by NMED and has not yet been approved. In future documents the Permittee must refrain from referencing documents that have not been approved by NMED, as it could be misleading to stakeholders reviewing documents. If referencing such documents is necessary, the Permittee must add a statement stating the official status of the referenced document (e.g., "currently in review by NMED".)

34. Section 3.0, Site Conditions, page 3-1, line 14

Permittee Statement: "The groundwater elevation graphs shown in Appendix A-1, illustrate that the operation of the Ridgecrest wellfield has a significant influence on the groundwater gradient at SWMUs ST-106/SS-111. Measurements from 2010 to 2015 indicated a north–northeast-oriented hydraulic gradient toward the Ridgecrest wellfield (Section 7.6.1.2 of KAFB, 2018a). However, with changes in Water Authority and Kirtland AFB pumping practices, the hydraulic gradient no longer has a consistent orientation each quarter. As described in the Q2 2018 report (Section 5.4.4.1 of KAFB, 2018c), the observed rise in groundwater levels across the plume area has occurred at the same time as a continual decrease in groundwater extraction at the Ridgecrest wellfield."

NMED Comment: Appendix A-1 does not clearly depict this. See Comments 35 and 36.

35. Section 3.0, Site Conditions, page 3-1, line 41

Permittee Statement: "Currently, these exceedances of EDB and benzene cannot be accurately bounded because GWM wells with non-detect concentrations of EDB and benzene to the southeast have submerged well screens."

NMED Comment: According to Figures 2-1, Proposed Monitoring Well Locations and Q2 2019 EDB Plume Map, and Figure 2-2, Proposed Monitoring Well Locations and Q2 2019 Benzene Plume Map, the southeast boundaries of both the benzene and EDB plumes are bounded by groundwater monitoring wells KAFB-106245 and KAFB-106247, neither of which have submerged well screens. According to these figures it appears that the southern and southwestern boundaries of these plumes are not bounded by any wells which do not have submerged well screens. Proposed groundwater monitoring well KAFB-106252 will close the southern data gap, however, additional wells may need to be installed in the future to delineate the southwestern edge of these plumes. No response required.

36. Section 6.4 Reporting, page 6-5, line 25

Permittee Statement: "Information and data collected during any quarter from drilling, installation, sampling, and gauging activities performed on the newly added monitoring wells will be submitted in SWMUs ST-106/SS-111 Quarterly Monitoring Reports."

NMED Comment: In accordance with Section 6.2.2.1.2, Site Investigations, Investigation Reports, and Section 6.2.4.3, Reporting Requirements, Investigation Reports of the KAFB Resource Conservation and Recovery Act (RCRA) Permit the information and data collected from all investigation activities related to this Work Plan must be submitted to NMED as a separate stand-alone Investigation Report.

37. Section 8.0 References, page 8-2, line 1

Permittee Statement: The Permittee cites, "KAFB, 2019c. *Source Zone Characterization Report Bulk Fuels Facility, SWMUs ST-106/SS-111*. Prepared by EA Engineering, Science, and Technology, Inc., PBC for USACE Albuquerque District under USACE Contract No. W912DR-12-D-006. November."

NMED Comment: The Permittee is reminded not to include references for documents that have not been approved by NMED.

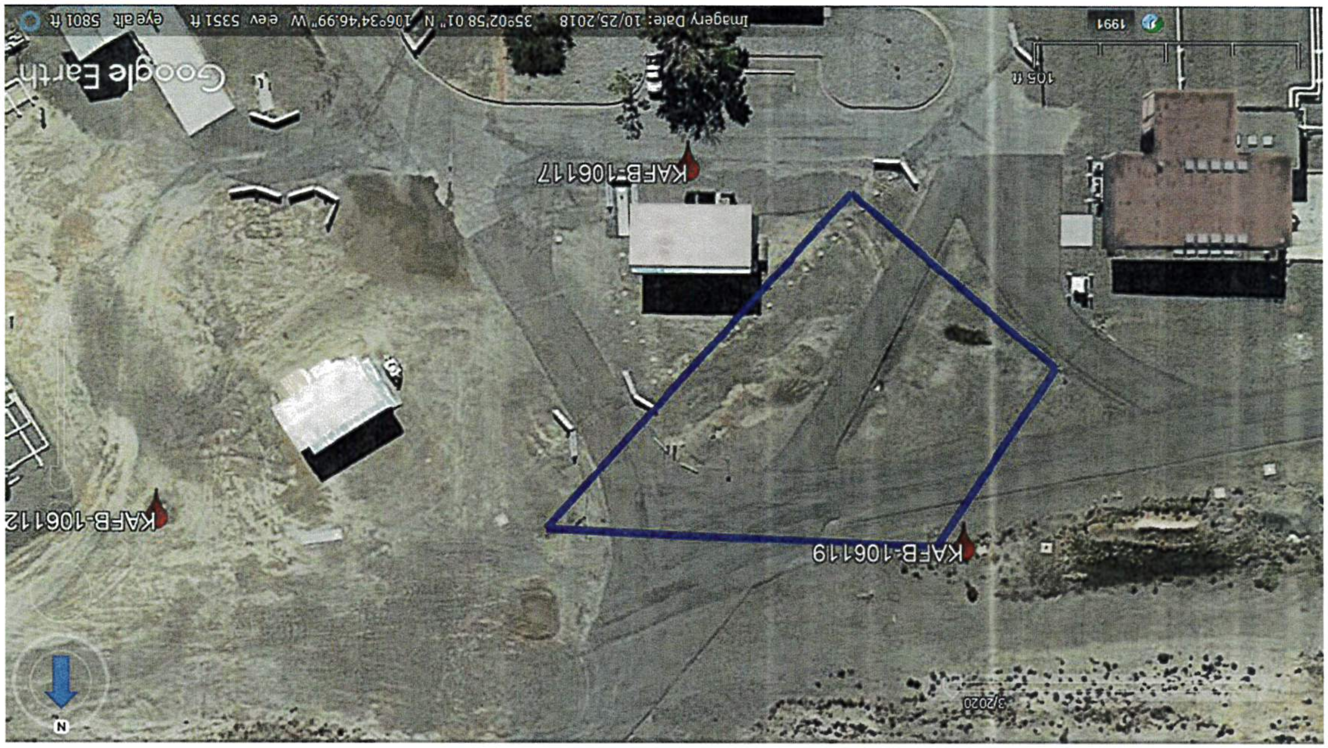
38. Appendix A-2 HISTORICAL GROUNDWATER PLUME MAPS

NMED Comment: The Permittee is reminded that all appendices must have properly numbered pages, tables, and figures. For example, the figure numbers presented in Appendix A-2 include five Figure 3-3's, three Figure 3-6's, two Figure 3-7's, three Figure 3-9's, and two Figure 3-10's. There is no Figure 3-1, Figure 3-2, Figure 3-4, Figure 3-5, or Figure 3-8. In all future submittals all figures, tables, and pages must be renumbered sequentially for the specific appendices they are placed in and include cross-references to corresponding tables and figures in referenced documents.

Attachment II

July 2020

Figure 1: Site map of KAFB Bulk Fuels Facility. The blue polygon represents the area proposed by NMED for relocating boreholes KAFB-106250 and KAFB-106251. Aerial imagery from Google Earth Pro, 2018.



Col. Miller and Lt. Col. Acosta
July 14, 20
Attachment II, Page 1 of 1

KAFB-19-015

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

16 July 2020

Colonel Ryan Nye, USAF
Vice Commander
377th Air Base Wing
2000 Wyoming Blvd SE
Kirtland AFB NM 87117

Mr. Kevin M. Pierard, Chief
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building 1
Santa Fe NM 87505-6303

Dear Mr. Pierard

The Air Force respectfully requests clarification from the New Mexico Environment Department (NMED) in reference to its statements in Comment 4 of the 26 May 2020 "*Disapproval Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, November 2019 Kirtland Air Force Base, New Mexico EPA ID# NM9570024423 HWB-KAFB-19-014*" (NOD). Comment 4 does not accurately reflect the administrative record on the Risk Assessment and does not accurately represent the path forward mutually agreed to by NMED and the Air Force as detailed in this letter. The Air Force requests that NMED issue a written clarification to address these inaccuracies.

Comment 4 of the NOD states:

"*The Permittee referenced a 2017 Risk Assessment throughout the Work Plan. The vapor intrusion pathway portion of the Permittee's 2017 Risk Assessment was not approved; therefore, all references to the results of the risk assessment must be removed from the revised Work Plan. Risk assessment is not appropriate when a site investigation has not yet been completed or where conditions at the site are being manipulated, such as during pilot tests. In addition, preparing and reviewing a premature risk assessment constitutes an ineffective use of resources for both the Air Force and NMED. Discussions between NMED and KAFB on May 7 resulted in both parties agreeing that conducting a risk assessment at this point in the project was neither appropriate nor beneficial. NMED is directing the Permittee to abandon completion of the risk assessment. This does not remove the requirement for the Permittee to investigate the potential for vapor intrusion into buildings and homes near the site. Please revise the Work Plan to remove references to the risk assessment.*"

As detailed below, Comment 4 ignores direction from NMED to perform an interim risk assessment and ignores NMED's approval of three sections of the Risk Assessment that are contained in the administrative record. Comment 4 also does not accurately represent discussions about the Risk Assessment in the 07 May 2020 conference call between NMED Hazardous Waste Bureau (HWB) staff and the Air Force.

NMED Administrative Record on 15 July 2017 Risk Assessment

In 2016, NMED and the Air Force agreed that an interim risk assessment was necessary to allay stakeholder concerns about possible impacts from the ethylene dibromide (EDB) plume to Albuquerque Bernalillo County Water Utility Authority (ABCWUA) production wells. A second objective of the Risk Assessment was to document completed interim measures (e.g., soil removal in Bulk Fuels Facility [BFF] source area) and ongoing interim measures (e.g., EDB plume pump and treat interim measure) that have mitigated risk to human health.

As stated in NMED's April 2017 "*KAFB Fuel Leak 2017 Strategic Plan*":

"*Site assessment and characterization activities are ongoing to address the few remaining data gaps in the EDB plume and source area. A RCRA Facility Investigation (RFI) report was submitted to the NMED on January 31, 2017.* ***A risk assessment is also part of the RFI and will be submitted April 2017. The risk assessment uses the nature and extent of fuel-related contamination to evaluate potential risk to human health and the environment, both on-KAFB and off.***"(emphasis added)

The 17 May 2017 letter from NMED entitled "*Notice of Deficiency, Risk Assessment Report, Resource Conservation and Recovery Act (RCRA) Facility Investigation Report, Bulk Fuels Facility Release Solid Waste Management Unit ST-106/SS-111 Kirtland Air Force Base EPA ID# NM9570024423, HWB-KAFB-13-MISC*" directs the Air Force to perform a risk assessment prior to the completion of the site investigation: "***As KAFB is aware, risk assessment is a critical component of the RCRA process…KAFB must submit the RAR*** [Risk Assessment Report] ***no later than June 30, 2017*** *or provide a written request with justification for an alternative submittal date within two weeks of receipt of this letter. If an alternative submittal date is requested, it must be attainable and not an arbitrary deadline, as NMED is unwilling to further prolong its submittal*" (emphasis added). A copy of this letter is provided in Attachment A.

The Air Force submitted an extension request for the completion of a risk assessment in a letter dated 28 June 2017. A copy of this letter is provided in Attachment B. This request was granted by NMED in a letter dated 05 July 2017 and the due date for the Risk Assessment was extended until 28 July 2017. A copy of this letter is provided in Attachment C.

The Risk Assessment was submitted to NMED in a letter dated 15 July 2017 entitled "*Risk Assessment Bulk Fuels Facility Release Solid Waste Management Unit ST-106/SS-111 Kirtland Air Force Base, New Mexico.*" The total cost to prepare the Risk Assessment was over $400,000.

A 19 December 2018 letter from NMED approved the following sections of the 15 July 2017 Risk Assessment:

- "***On-site surface and mixed zone soil*** *- NMED agrees that surface and mixed zone soil contaminant levels do not pose unacceptable risks to current/future commercial/industrial workers at the BFF, to future construction workers at the BFF, and to future hypothetical residents at the BFF.*
- ***Off-Base surface and mixed zone soil*** *- NMED agrees that there are no complete or potentially complete exposure pathways for surface and mixed soil zone for off-Base receptors.*
- ***Groundwater*** *- NMED agrees that groundwater impacted by contaminants from the BFF is not currently used as a drinking water source, and that the ongoing interim corrective measures and LUCs are necessary to prevent exposure.*"

In this letter NMED provided its technical basis for these approvals:

- "***Soil*** *- The HHRA* [Human Health Risk Assessment] *identified complete and potentially complete soil exposure pathways for the on-site current/future commercial/industrial workers at the BFF, future construction workers at the BFF, and future hypothetical residents at the BFF. Total soil risks based on the maximum detected concentrations were at or below NMED target risk levels. Therefore, no unacceptable risk was identified based on exposure to on-site surface soil (0 to 1 foot below ground surface) or mixed soil zone (0 to 10 feet below ground surface) within the BFF. Additionally, as no contaminated surface or mixed zone soil is present off-Base, therefore, there are no complete or potentially complete exposure pathways for impacted soil for off-Base receptors.*
- ***Groundwater*** *- The HHRA determined that groundwater impacted by contaminants from the BFF is not currently used as a drinking water source and that Land Use Controls ("LUCs") are in place to prevent exposure. Therefore, there are currently no complete exposure pathways for groundwater on-site or off-Base. Additionally, in order to inform risk management decisions and evaluate an unrestricted use scenario, domestic use of groundwater was evaluated on-site and off-Base. Total risks calculated using NMED tap water screening levels exceeded NMED target levels.*

  The New Mexico Office of the State Engineer issued a well drilling moratorium associated with BFF corrective action activities on February 9, 2017. The intent of this moratorium is to protect human health and prevent interference with ongoing corrective action activities by restricting the drilling of new wells and the transfer of water rights within the boundaries specified by NMED. BFF contaminants have not been detected in off-Base water supply sentinel wells at concentrations exceeding drinking water standards. In addition, KAFB drinking water supply wells are sampled monthly and no BFF contaminants exceeding screening levels have been detected. Based on the results of the HHRA, the interim corrective measures (groundwater extraction and treatment system) and LUCs are needed to prevent direct contact with groundwater."

In summary, NMED's statement in the 26 May 2020 NOD that "*…Risk assessment is not appropriate when a site investigation has not yet been completed or where conditions at the site are being manipulated, such as during pilot tests. In addition, preparing and reviewing a* *premature risk assessment constitutes an ineffective use of resources for both the Air Force and NMED…*" directly contradicts prior direction to perform the Risk Assessment from NMED to the Air Force and dismisses NMED's conclusions regarding three exposure pathways. As Mr. Mark Correll, Deputy Assistant Secretary of the Air Force for Environment, Safety and Infrastructure, stated to and received concurrence from Cabinet Secretary James Kenney during our 07 January 2020 meeting, the Air Force has a right to rely on prior commitments and direction from NMED to ensure federal resources are spent appropriately to continue to move this project towards final remedy selection.

Agreements between NMED and Air Force during the 07 May 2020 Conference Call

NMED's statement in the 26 May 2020 NOD that "*Discussions between NMED and KAFB on May 7 resulted in both parties agreeing that conducting a risk assessment at this point in the project was neither appropriate nor beneficial*" misrepresents the risk assessment path forward mutually agreed to by NMED and the Air Force. During this call, the Air Force explained to the HWB staff that the Risk Assessment was performed at NMED's direction. The Air Force also provided the history leading up to the decision to perform an interim risk assessment. The Air Force did not agree "*that conducting a risk assessment at this point in the project was neither appropriate nor beneficial*." NMED's conclusions in the 19 December 2018 letter that there are currently no complete exposure pathways for groundwater on or off Kirtland Air Force Base, and that there are no risks to human health from on-site surface and mixed zone soil, are beneficial to this project. Performing an interim risk assessment during a long investigative phase ensures accurate risk communication with the public.

Furthermore, NMED's statement in the 26 May 2020 NOD that "*NMED is directing the Permittee to abandon completion of the risk assessment*" is accurate but not complete. NMED and the Air Force agreed that an updated Risk Assessment would be performed concurrent with the Corrective Measures Evaluation. This update would include the new shallow soil vapor data as well as an evaluation of groundwater data collected after the completion of the interim risk assessment.

In summary, Comment 4 in the 26 May 2020 NOD does not accurately reflect the administrative record on the Risk Assessment nor does it accurately represent the path forward mutually agreed to by NMED and the Air Force. The Air Force requests that NMED issue a written clarification of Comment 4 to address these inaccuracies.

If you have any questions or would like to schedule a call to discuss these issues further, please contact Mr. Sheen Kottkamp at 505-846-7674 or sheen.kottkamp.1@us.af.mil.

Sincerely

RYAN NYE, Colonel, USAF
Vice Commander

Attachment A:
Memorandum from Juan Carlos Borrego, NMED, to Col Eric H. Froehlich and Lt Col Wayne J. Acosta, KAFB, with the subject line: *Notice of Deficiency, Risk Assessment Report, Resource Conservation and Recovery Act (RCRA) Facility Investigation Report, Bulk Fuels Facility, Release Solid Waste Management Unit ST-106/SS-111, Kirtland Air Force Base, EPA ID# NM9570024423, HWB-KAFB-13-MISC*. 24 May 2017.

Attachment B:
Memorandum from Col Richard W. Gibbs, KAFB, to Mr. John Kieling, NMED. 28 June 2017.

Attachment C:
Memorandum from Juan Carlos Borrego, NMED, to Col Richard W. Gibbs and Lt Col Wayne J. Acosta, KAFB, with the subject line: *Extension Request, Risk Assessment Report, Bulk Fuels Facility Spill, Solid Waste Management Unit ST-106/SS-111, Kirtland Air Force Base, EPA ID# NM9570024423, HWB-KAFB-MISC*. 5 July 2017.

cc:
NMED HWB (Pierard), electronic and hardcopy
NMED Resource Protection Division (Stringer), electronic only
NMED HWB (Cobrain), electronic only
NMED OGC (Hower), electronic only
SAF/IEE (Lynnes), electronic only
377 ABW/JA (Ciccarelli), electronic only
AFCEC/CZ (Cash, Kottkamp, Segura), electronic only
USACE-ABQ District Office (Moayyad), electronic only
Public Info Repository, Administrative Record/Information Repository (AR/IR) and File

ATTACHMEN

NEW MEXICO
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JOHN A. SANCHEZ
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BUTCH TONGATE
Cabinet Secretary

J. C. BORREGO
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

May 24, 2017

Colonel Eric. H. Froehlich
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117-5606

Lieutenant Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil Engineering Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117-5270

RE: NOTICE OF DEFICIENCY, RISK ASSESSMENT REPORT, RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION REPORT, BULK FUELS FACILITY RELEASE
SOLID WASTE MANAGEMENT UNIT ST-106/SS-111
KIRTLAND AIR FORCE BASE
EPA ID# NM9570024423, HWB-KAFB-13-MISC

Dear Colonel Froehlich and Lt. Colonel Acosta:

On January 31, 2017, Kirtland Air Force Base ("KAFB" or "Permittee") submitted the Resource Conservation and Recovery Act ("RCRA") Facility Investigation ("RFI") Report to the New Mexico Environment Department ("NMED"). In the transmittal letter for the RFI Report, KAFB acknowledged the requirement to also submit a Risk Assessment Report ("RAR") and stated that the RAR would be "submitted under separate cover in March 2017."

NMED understands and acknowledges that data quality concerns with the CARB 422 soil vapor analytical method were identified during the risk assessment process. These concerns were brought to the attention of the NMED at the February 22, 2017 technical working group meeting and were formally submitted in a letter submitted to NMED dated April 3, 2017. In February, NMED gave KAFB verbal approval to proceed with the risk assessment using the TO-15 soil vapor data so that progress could continue to be made on the RAR.

As KAFB is aware, risk assessment is a critical component of the RCRA process. Additionally, both NMED and KAFB have been assuring the public that a RAR would be submitted in the near future, initially committing that it would be submitted with the RFI Report in January 2017, and then in March 2017 as stated in the RFI transmittal letter. By the March 2017 public meeting, KAFB had shifted the projected delivery date of the RAR to April 2017. To date, NMED has not received the RAR, nor a communication of schedule for delivery of this required document. Therefore, NMED finds KAFB to be deficient in its submittal of the RAR.

KAFB must submit the RAR no later than June 30, 2017 or provide a written request with justification for an alternative submittal date within two weeks of receipt of this letter. If an alternative submittal date is requested, it must be attainable and not an arbitrary deadline, as NMED is unwilling to further prolong its submittal.

If you have any questions regarding this letter, please contact John Kieling at (505) 476-6035 or Diane Agnew at (505) 222-9555.

Sincerely,

Juan Carlos Borrego
Deputy Secretary
Environment Department

cc: Col. M. Harner, KAFB
K. Lynnes, KAFB
A. Bodour, KAFB-AFCEC
T. Simpler, USACE
M.L. Leonard, AEHD
F. Shean, ABCWUA
L. King, EPA-Region 6 (6PD-N)
J. Kieling, NMED-HWB
D. Agnew, NMED-GWQB
S. Pullen, NMED-GWQB
M. Hunter, NMED-GWQB

File: KAFB 2017 Bulk Fuels Facility Spill

ATTACHMEN

ENTERED

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

JUN 28 2017

Colonel Richard W. Gibbs
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland Air Force Base NM 87117

RECEIVED
JUN 28 2017

Mr. John Kieling
Hazardous Waste Bureau Chief
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building 1
Santa Fe NM 87505-6303

Dear Mr. Kieling

The Air Force is requesting an extension on the submittal date for the Kirtland Air Force Base Bulk Fuels Facility release Solid Waste Management Unit ST-106/SS-111 Risk Assessment Report from June 30, 2017 to July 28, 2017 per NMED's Notice of Deficiency dated May 24, 2017. As a final level of review, Air Force Civil Engineer Center (AFCEC) utilized Dr. Shannon Garcia as a subject matter expert (SME) who has extensive experience with human health risk assessments for sites in New Mexico. During her review, Dr. Garcia identified two key changes to the risk assessment that would enhance the analysis of soil gas data by being more conservative and comprehensive. We request this additional time to incorporate our SME's comments, which will involve additional calculations and review.

If you have any questions or concerns, please contact Mr. Scott Clark at (505) 846-9017 or at scott.clark@us.af.mil or Dr. Adria Bodour at (210) 241-6276 or at adria.bodour.1@us.af.mil.

Sincerely

RICHARD W. GIBBS, Colonel, USAF
Commander

cc:
NMED, Deputy Secretary (Borrego), letter
NMED-GWQB (Agnew, Hunter), letter
EPA Region 6 (Ellinger, King), letter
SAF-IEE (Lynnes), electronic only
AFCEC/CZ (Bodour, Clark, O'Grady), electronic only
USACE-ABQ District Office (Dreeland, Phaneuf, Salazar, Sanchez, Simpler), electronic only
Public Info Repository, Administrative Record/Information Repository (AR/IR) and File

KAFB4544

1 of 1

Atch B

ATTACHMEN ENTERED

State of New Mexico
ENVIRONMENT DEPARTMENT

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BUTCH TONGATE
Cabinet Secretary
J. C. BORREGO
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

July 5, 2017

Colonel Richard W. Gibbs
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117-5606

Lieutenant Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil Engineering Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117-5270

RE: EXTENSION REQUEST
RISK ASSESSMENT REPORT, BULK FUELS FACILITY SPILL
SOLID WASTE MANAGEMENT UNIT ST-106/SS-111
KIRTLAND AIR FORCE BASE
EPA ID# NM9570024423, HWB-KAFB-MISC

Dear Colonel Gibbs and Lt. Colonel Acosta:

The New Mexico Environment Department ("NMED") received the U.S. Air Force's ("Permittee") request for an extension to submit the *Bulk Fuels Facility release Solid Waste Management Unit ST-106/SS-111 Risk Assessment Report*. The Permittee is requesting that the due date for the Risk Assessment Report be extended to July 28, 2017 instead of June 30, 2017. The Permittee cites the need for additional time to incorporate comments received from the Air Force Civil Engineer Center subject matter expert ("SME"). The Permittee believes that the incorporation of the SME comments will result in an enhanced soil gas data analysis that is more conservative and comprehensive for the site.

The extension request is hereby approved. Therefore, the Risk Assessment Report is due no later than July 28, 2017.

KAFB4557

If you have any questions regarding this letter, please contact Diane Agnew at (505) 222-9555.

Sincerely,

JCB

Juan Carlos Borrego
Deputy Secretary
Environment Department

cc: Col. M. Harner, KAFB
K. Lynnes, KAFB
A. Bodour, KAFB-AFCEC
T. Simpler, USACE
M.L. Leonard, AEHD
F. Shean, ABCWUA
L. King, EPA-Region 6 (6PD-N)
J. Kieling, NMED-HWB
D. Agnew, NMED-GWQB
S. Pullen, NMED-GWQB
M. Hunter, NMED-GWQB

File: KAFB 2017 Bulk Fuels Facility Spill

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

31 July 2020

Colonel David S. Miller, USAF
Commander
377th Air Base Wing
2000 Wyoming Blvd SE
Kirtland AFB NM 87117

Mr. Kevin Pierard and Mr. Dave Cobrain
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building 1
Santa Fe NM 87505

Dear Mr. Pierard and Mr. Cobrain

The Air Force has reviewed the 26 May 2020 letter "*Disapproval, Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, November 2019, Kirtland Air Force Base, New Mexico EPA ID# NM9570024423 HWB-KAFB-19-014*". Kirtland Air Force Base (AFB) respectfully requests a meeting with the Hazardous Waste Bureau (HWB) to discuss comments #5, #7, and #8 to facilitate our development of a revised work plan. A draft response to comments table is attached to assist in your preparation for this meeting.

As discussed previously with Mr. Pierard and Ms. Stringer, the Air Force has concerns regarding Comment #4, which discusses the role of the 2017 Risk Assessment in the development of the 2019 Work Plan. The Air Force has responded to those concerns in a separate letter dated 16 July 2020.

Please contact Mr. Sheen Kottkamp at (806)463-0811 or email sheen.kottkamp.1@us.af.mil to set up a meeting to assist us in resolving these outstanding comments.

Sincerely

DAVID S. MILLER, Colonel, USAF
Commander

Attachment
Attachment 1. Document Review Preliminary Comment Response Table

cc:
NMED HWB (Pierard, Cobrain), letter and electronic
NMED RPD (Stringer), electronic only
EPA Region 6 (King, Ellinger), electronic only
SAF/IEE (Lynnes), electronic only
AFCEC/CZ (Cash, Kottkamp, Segura), electronic only
USACE-ABQ District Office (Moayyad, Phaneuf, Dreeland, Cordova, Kunkel), electronic only
Public Info Repository, Administrative Record/Information Repository (AR/IR) and File

40 CFR 270.11
DOCUMENT CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

DAVID S. MILLER, Colonel, U.S. Air Force
Commander, 377th Air Base Wing

31 July 2020
Date

Attachment 1. Document Review Preliminary Comment Response Table

Project Manager:		**Document Date:**	**8/28/2020**	**NMED Letter Date:**	**5/26/2020**	**Document Version #:**	**Version 3**
Document Title:	**Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, November 2019**						
Review Cycle:	**NMED**	**Contractor:**	**HazAir**	**CRT Start Date:**	**6/18/2020**	**CRT (Review Cycle) Completed Date:**	**7/10/2020**

COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
1	NMED		App. A	<u>**GENERAL COMMENTS**</u> **Permittee Response to NMED's July 26, 2019 Rejection Comments** **NMED Comment:** The Permittee must include their Response to Comments (RTCs) in a document appendix for all revised documents submittals. While the Permittee submitted the RTCs in a separate electronic file, the RTCs must be included as an appendix to the plan to allow stakeholders and the public easy access when reviewing the document. For all future revised documents submitted to NMED, the Permittee must include the RTCs as an appendix to the document. Please revise the Work Plan accordingly. This was discussed on May 7; KAFB agreed to follow this procedure.	Concur. RTCs will be included as Appendix A within this document. The Air Force will coordinate with NMED for document structure regarding future submittals.	NO

Attachment 1. Document Review Preliminary Comment Response Table

<table>
<tr><td>2</td><td>NMED</td><td></td><td>Global</td><td>Permittee Response to NMED’s July 26, 2019 Rejection Comments #1

NMED Comment: Comment #1 of NMED’s July 26, 2019 Rejection letter states, “...the pages of the attachments contain no page numbers...In order for NMED to be able provide comments that reference where issues are found, as well as for the public to be able to review the document in the Administrative Record, every page of every document submitted must be numbered appropriately. The Permittee must submit a work plan in the appropriate format, including addition of the appropriate information in the corresponding sections, based on the Permit requirements and must sequentially number every page in the document.”

The Permittee failed to sequentially number all pages of the document as directed by NMED in the Tables section, the Figures Section, and all three appendices of the Work Plan. In addition, the appendices contain tables with no table numbers, figures with no figure numbers, and multiple pages with no page numbers at all. The Permittee must ensure that all submittals, including the revised Work Plan, include sequential page numbers on all pages, and that tables, figures, and appendices are properly numbered. Making this correction will facilitate timely review and precise communication between NMED and KAFB on all documents submitted for review. It will also facilitate references to information and subsequent activities (e.g., review of corrective action documents). Please revise the Work Plan accordingly. This was discussed on May 7; KAFB agreed to follow this procedure.</td><td>Concur. All pages will be numbered sequentially, and all tables and figures, including those in the appendices, will be numbered appropriately. Please see the table (provided in response letter) for examples of the numbering schemes in use. Line numbers will also be added to the document in order that NMED may more easily review comment responses.

<table>
<tr><th>Content</th><th>Example Numbering Scheme</th></tr>
<tr><td>Page numbers for introductory sections including the table of contents, acronyms, etc.</td><td>i, ii, iii…</td></tr>
<tr><td>Page numbers for the bulk of the text within the work plan</td><td>[Section # - Page Number]
1-1, 1-2, 1-3…
2-1, 2-2, 2-3…</td></tr>
<tr><td>Page numbers for the appendices</td><td>[Appendix Letter - Page Number]
A-1, A-2, A-3…
B-1, B-2, B-3…</td></tr>
<tr><td>Table numbering</td><td>[Section # - Table #]
Table 1-1, Table 1-2, Table 1-3…
Table 2-1, Table 2-2, Table 2-3…

Note: Tables spanning multiple pages will be additionally marked “Page x of y”.</td></tr>
<tr><td>Figure numbering</td><td>[Section # - Figure #]
Figure 1-1, Figure 1-2, Figure 1-3…
Figure 2-1, Figure 2-2, Figure 2-3…</td></tr>
<tr><td>Table numbering (Appendices)</td><td>[Appendix Letter - Table #]
Table A-1, Table A-2, Table A-3…
Table B-1, Table B-2, Table B-3…

Note: Tables spanning multiple pages will be additionally marked “Page x of y”.</td></tr>
<tr><td>Figure numbering (Appendices)</td><td>[Appendix Letter - Figure #]
Figure A-1, Figure A-2, Figure A-3…
Figure B-1, Figure B-2, Figure B-3…</td></tr>
</table></td><td>NO</td></tr>
<tr><td>3</td><td>NMED</td><td></td><td>Global</td><td>Well Designations</td><td>Concur. One numbering scheme will be used for the soil vapor monitoring (SVM) wells throughout the Work Plan. The well designations will be as follows:
Proposed Vapor Well Designations:</td><td>NO</td></tr>
</table>

Attachment 1. Document Review Preliminary Comment Response Table

COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
				NMED Comment: The Permittee has used multiple designations for wells in the Work Plan. For instance, Section 3.1 of the Work Plan discusses wells KAFB-SV-01, KAFB-SV-02, KAFB-SV-03, etc., while Table 1 of the Work Plan lists these wells as KAFB-106-SV01, KAFB-106-SV02, KAFB-106-SV03, etc. and Figure 2 of the Work Plan lists the wells as KAFB-106SV01, KAFB-106SV02, KAFB-106SV03, etc. Use of multiple designations inhibits NMED's ability to timely review documents by limiting the search function and causing confusion when searching for data in spreadsheets or databases. This issue is evident in many documents submitted by the Permittee. The Permittee must use the official full designation for each well consistently in the revised Work Plan and in all future documents submitted to NMED. This was discussed on May 7; KAFB agreed to follow this procedure.	KAFB-106SV01 KAFB-106SV02 KAFB-106SV03 KAFB-106SV04 KAFB-106SV05 KAFB-106SV06 KAFB-106SV07 KAFB-106SV08. A comprehensive table of soil vapor monitoring locations and designations will be provided as an attachment to the Work Plan.	
4	NMED		Global	**Risk Assessment** **NMED Comment:** The Permittee referenced a 2017 Risk Assessment throughout the Work Plan. The vapor intrusion pathway portion of the Permittee's 2017 Risk Assessment was not approved; therefore, all references to the results of the risk assessment must be removed from the revised Work Plan. Risk assessment is not appropriate when a site investigation has not yet been completed or where conditions at the site are being manipulated, such as during pilot tests. In addition, preparing and reviewing a premature risk assessment constitutes an ineffective use of resources for both the Air Force and NMED. Discussions between NMED and KAFB on May 7 resulted in both parties agreeing that conducting a risk assessment at this point in the project was neither appropriate nor beneficial. NMED is directing the Permittee to abandon completion of the risk assessment. This does not remove the requirement for the Permittee to investigate the potential for vapor intrusion into buildings and homes near the site. Please revise the Work Plan to remove references to the risk assessment.	Comment noted. Extraneous information related to the risk assessment will be removed from the work plan. The Air Force respectfully requests to address and respond in a separate letter to the concerns with the 2017 Risk Assessment and related information contained within this Work Plan.	YES
5	NMED		Appendices	**Appendices** **NMED Comment:** The Permittee included three appendices in the Work Plan that contain historical data tables. Well construction details, purge volumes, and field measurements for existing deeper soil vapor monitoring wells are not useful for sighting shallow soil vapor monitoring wells related to vapor intrusion. In addition, including the analytical tables for the entire suite of VOC analytes is not useful. Select prevalent VOCs and annual concentration contour maps would be more appropriate for citing well locations. In addition, the	Comment noted. Extraneous data, including well construction details, purge volumes, historic field measurements, and analytical tables for the entire suite of VOCs, will be removed from the Work Plan. NMED meeting is requested to resolve this comment regarding sample locations and the conceptual site model and the justification for the selection of sample locations. The work scope and soil vapor monitoring (SVM) locations were developed using both published guidance and a comprehensive understanding of the project site, which we	YES

Attachment 1. Document Review Preliminary Comment Response Table

COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
				Permittee must develop the investigation by incorporating the direction provided in both NMED's February 25, 2019 letter and EPA's OSWER publication 9200.2-154, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*, USEPA, June 2015 (EPA VI Guidance) to provide the rationale for the well locations. Failure to follow NMED direction or EPA guidance must be explicitly justified in the revised Work Plan. It is also recommended that the Permittee discuss this with NMED in advance of submitting a revised Work Plan. Please remove extraneous data and provide appropriate justification for proposed well locations in the revised Work Plan. This was discussed on May 7; KAFB agreed to modify the Work Plan.	present to you in this letter for your review and for discussion during our subsequent meeting. SVM locations were chosen using guidance contained in Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) publication 9200.2-154, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (EPA, 2015); EPA OSWER publication EPA-530-R-10-003, *Conceptual Model Scenarios for the Vapor Intrusion Pathway* (EPA, 2012); Interstate Technology & Regulatory Council (ITRC) guidance, *Evaluating Natural Source Zone Depletion at Sites with LNAPL* (ITRC, 2009); and other applicable guidance. OSWER guidance states that "available and readily ascertainable information" should be used to develop the initial understanding of the potential for human health risks. It is understood, based on the results of periodic SVM and the soil vapor extraction (SVE) shutdown test performed in 2015, that utility corridors are not a primary transport mechanism for vapor intrusion at the Kirtland Bulk Fuels Facility (BFF) site (Solid Waste Management Units ST-106/SS-111). The primary mechanism by which vapors could reach off-site buildings and homes is through volatilization of dissolved contaminants near the top of the water table, in the capillary fringe, and to a lesser extent laterally from the vadose zone source area at depths where residual light non-aqueous phase liquid (LNAPL) remains. The BFF is a mature site with a mature stage of characterization—there are 56 SVM wells, and each well has between one and six SVM points (SVMPs) set at specified depths for a total of 285 SVM points. Five SVM locations are off base and include 28 SVMPs between 25 feet and 450 feet below ground surface (bgs). Data from the second quarter (Q2) of 2019 (KAFB, 2019a) used to support the work plan show low contaminant concentrations in off-base SVMPs compared to locations near the former fuel offloading rack (FFOR). Ethylene dibromide (EDB) was detected in two of the 28 off-base SVMPs (2.6 micrograms per square meter [$\mu g/m^3$] and 1.4 $\mu g/m^3$) at 450 feet bgs (directly above the water table). Benzene was detected in 18 of the 28 SVMPs: 16 of the 18 detections were less than 1.6 $\mu g/m^3$, and the other two detections were at 450 feet bgs (2.7 $\mu g/m^3$ and 19 $\mu g/m^3$). A contamination investigation begins near the source and systematically moves outward until non-detects are identified, which is what was done at the BFF site. Shallow soil samples collected from sub-slab locations are more likely to identify vapors from unrelated sources rather than from the BFF site, and "…*if field evidence indicates that soil gas concentrations increase with distance from the presumed source, the presence of an additional source should be considered*" (EPA, 2012; Section 4.3.4; page 40).	

Attachment 1. Document Review Preliminary Comment Response Table

COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
					SVM locations must be based on a practical and theoretical understanding of the vapor intrusion pathway at the BFF site. Vapor phase transport in the subsurface is controlled by diffusion, advection, phase partitioning, and degradation (primarily biodegradation for petroleum hydrocarbons). The horizontal and vertical distance over which vapors may migrate in the subsurface depends on: • source depth and location, • age of leak, • vadose zone characteristics, • depth to groundwater, and • groundwater concentrations. Source Depth and location The source material is much deeper than the depth of utility corridors. Residual LNAPL is present primarily near the groundwater table in the vicinity of the benzene plume (KAFB, 2020) and from residual LNAPL in the source area at depths greater than 20 feet. Residual source area soils with vapor total petroleum hydrocarbon concentrations greater than 10 parts per million by volume are 1,100 feet from hospital receptors and more than 1,500 feet from residential receptors (KAFB, 2020). These distances are greater than expected for transport by diffusion from the LNAPL sources. Therefore, collecting shallow soil vapor samples from sub-slab locations is significantly more likely to provide data from unrelated sources located in the city of Albuquerque. A search of the NMED- Petroleum Storage Tank Bureau (PSTB) records and the Veteran Affairs wellhead protection information indicates that fuel releases have been reported from tanks at the Raymond G. Murphy Veteran Affairs Medical Center and from at least four fuel storage sites in the vicinity of the subject residential receptors (NMED FID 26698, 26751, 26589, and 27712). The Air Force has a strict policy and legal obligation that prevents use of appropriated funds from being used to investigate sites that are attributed to other parties. Therefore, placing sample locations in areas that are not a reasonable distance from documented contamination is not feasible. Approximately 5,000 tons of contaminated soil were excavated to a depth of 20 feet in the source area, and the equivalent of about 775,000 gallons of fuel were removed from the vadose zone in the source area through SVE and bioslurping, effectively removing the shallow source material.	

Attachment 1. Document Review Preliminary Comment Response Table

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					<u>Age of Leak</u> The BFF leak is decades old and highly weathered (highly degraded). According to EPA, "*Many petroleum hydrocarbons may naturally biodegrade in the vadose zone through the actions of microorganisms found naturally in soil. When oxygen supply from the atmosphere is sufficient, biodegradation of petroleum hydrocarbons can occur relatively quickly, will generally produce less harmful compounds (i.e., biodegradation products), and can result in substantial attenuation of petroleum hydrocarbon vapors over relatively short distances in the vadose zone"* (EPA, 2015; Section 1.3.1; page 9). Furthermore, the shallow source material has been removed (e.g., approximately 5,000 tons of contaminated soil removed to a depth of 20 feet; about 775,000 equivalent gallons of fuel removed from the vadose zone through soil vapor extraction and bioslurping). <u>Vadose Zone Characteristics</u> Numerous investigations have evaluated vadose zone characteristics. Vadose zone investigations performed from 2000 through 2015 have been catalogued in the Phase I RCRA Facility Investigation Report (KAFB, 2018). Recent investigations (AECOM, 2020; KAFB, 2019b) studied a significant clay layer, ranging in thickness from 5 feet to 50 feet thick, approximately 260 feet bgs. These investigations used stratigraphic analysis and analytical data from soil cores to further investigate the mechanisms that controlled LNAPL transport from the original release point at the FFOR to the water table. Soil core data suggest that LNAPL maintained a near vertical migration pathway through the higher permeable areas around as well as through the clays. This indicates that LNAPL migration was dominated by gravity drainage rather than horizontal migration along low permeability (i.e., clay or silt) zones. Stratigraphic analysis of the clay layer indicates a dip direction to the south, away from residential areas (see Figure 1 at end of RTC table). No investigative work indicates evidence that LNAPL migrated north of the source area at the FFOR. <u>Depth to Groundwater and Groundwater Concentrations</u> Groundwater is very deep—about 450 feet deep in residential areas. Off-gassing from groundwater is a highly unlikely source of vapor intrusion. Off-gassing from groundwater is not the only potential source of soil vapors, but it is a predominant mechanism.	

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					Dissolved concentrations of petroleum hydrocarbons beneath off-site buildings and homes (the target capture zone) are below project screening levels. The Q1 2020 report shows the highest concentration in the target capture zone at well KAFB-106041, which had an EDB concentration of 0.049 microgram per liter (µg/L; below the project screening level of 0.05 µg/L) (see Figure 2 at end of RTC table). The majority of wells in the target capture zone were non-detects. These low concentrations, combined with the vertical distance away from off-site buildings and homes, ensure that vapors will not reach the surface here. **Figures** Figure 1. Cross Section of 250-foot Clay Layer from North to South (originally published in AECOM, 2020) Figure 2. EDB Groundwater Concentrations Q1 2020 (originally published in KAFB, 2020)	
6	NMED	2-1	2.2	**Permittee Statement:** "Samples collected for the evaluation of the vapor intrusion pathway were from depths of 15 to 25 feet below ground surface (bgs), which is deeper than the 10-foot depth used by NMED for VISLs. This imparted a high degree of conservatism to the risk characterization." **NMED Comment:** The Permittee references data from samples collected from depths of 15 to 25 feet bgs. The data presented in the Work Plan is from samples collected from 25 to 30 feet bgs, not 15 to 25 feet bgs. Please provide an explanation and resolve the discrepancy for accuracy in the revised Work Plan. In addition, the final statement is not appropriate in a section regarding site history, as only historic facts belong in the background section. This statement must be removed from the Work Plan. Also, please remove references to the risk assessment from the revised Work Plan per Comment 2. This was discussed on May 7; KAFB agreed to follow this procedure.	Concur. The statement will be removed from the Work Plan. Please see the response to NMED Comment #4 regarding further references to the risk assessment.	NO
7	NMED	3-1	3.1	**Permittee Statement:** "Four of the proposed SVMP locations (KAFB-SV-01, KAFB-SV-02, KAFB-SV-03, and KAFB-SV-07) were selected to provide shallow soil vapor sample data at sites adjacent to existing vapor point nests having deeper completions." **NMED Comment:** NMED's February 25, 2019 letter requiring this Work Plan specifically directed the Permittee to conduct sampling "in the residential area north of Ridgecrest or amid buildings on the VA hospital campus." In addition,	NMED meeting is requested to resolve this comment regarding EPA Guidance and sample locations justification. See response to comment #5.	YES

Attachment 1. Document Review Preliminary Comment Response Table

COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
				the EPA VI Guidance states, "EPA recommends that soil gas samples be taken as close to the areas of interest as possible and preferably from directly beneath the building structure." The EPA Guidance also states, "[d]epending on the CSM [conceptual site model], sampling of vapors within the utility corridor (or within a sewer, if present) may be warranted to characterize vapor migration in the subsurface..." The Work Plan proposes only one of the eight wells within approximately 50-feet of a building. Only one is proposed north of Ridgecrest Drive, and it is in a park approximately 130-feet from the nearest home. In addition, there is no mention of utility corridors or other potential conduits in the Work Plan. This indicates that the Permittee has not followed NMED direction or EPA guidance. The Permittee must follow NMED direction and EPA guidance or provide justification for not doing so. It is recommended that the Permittee discuss this with NMED prior to submittal of the revised Work Plan. Please provide a rationale for well siting including a discussion of all potential vapor conduits. In the revised Work Plan, the Permittee must provide a thorough CSM, propose appropriate sampling locations that address the area of concern provided by NMED, and follow the direction provided in the EPA VI guidance or provide justification for not doing so.		
8	NMED	3-2	3.1	**Section 3.1, Soil Vapor Monitoring Locations, page 3-2** **Permittee Statement:** "Proposed SVMP locations were selected carefully to avoid areas in roadways and parking lots with heavy vehicular traffic for the following reasons: • Potential sources of benzene, toluene, ethylbenzene, and xylenes may exist in shallow soils beneath roadways that could interfere with the objectives of this sampling event. • Interference from vehicular traffic during the sampling may impact vapor concentrations in shallow soils under certain barometric conditions giving potential false positive results." **NMED Comment:** Consistent with NMED direction and EPA's VI Guidance for siting monitoring wells, soil vapor monitoring must include areas where vapors may accumulate in close proximity to buildings or homes. Pavement	NMED meeting is requested to resolve this comment regarding EPA Guidance and sample locations justification. See response to comment #5.	YES

Attachment 1. Document Review Preliminary Comment Response Table

COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
				near buildings or homes, such as in parking lots, provides a semi-impermeable cap above the subsurface which may trap contaminate vapors and cause them to pool. The Permittee must address the concern of vapor contaminants beneath pavement and near buildings and homes and address the issue of contaminant vapor migration through utility corridors. Utility corridors provide a conduit for the transport of contaminant vapors. The Permittee must provide a thorough CSM including maps depicting paved areas and all utility corridors in the areas of concern. The Permittee must also evaluate these maps in conjunction with historic soil vapor data and propose sampling locations that will provide characterization of the subsurface below pavement, as well as the utility corridors between the source area and the buildings of concern, in the revised Work Plan.		
9	NMED	6-1	6.1	**Permittee Statement:** "The sampling train will also be equipped with an isolation valve position between the vacuum pump/field sensors and the SUMMA® canister that will be open during purging to allow for monitoring of purge vapors. This valve will be closed prior to sample collection to ensure that vapor taking into the SUMMA® canister does not flow backwards through the vacuum pump or field sensors." **NMED Comment:** The Work Plan must be revised to include the use of a 3-way valve in the location of the "hose barb t-fitting" above the Summa canister in Figure 5. A 3-way valve will ensure that the sample can only be collected from the well side of the sample train and eliminate the possibility of pulling air back from the pump. The proposed separate "isolation" valve is subject to operator error and may lead to the collection of non-representative samples. This was discussed on May 7; KAFB agreed to follow this procedure.	Concur. The work plan, including Figure 5, will be adjusted to incorporate the use of a 3-way valve as per NMED's suggestion.	NO
10	NMED	6-1	6.1	**Permittee Statement:** "Based upon calculated volume of the deepest tubing set and sampling train (25 ft x 1/4 in. diameter) and the flow rate of the proposed vacuum pump (0.75 cfm) required to fully purge one bore volume of the tubing is less than one minute. Therefore, the proposed ten minutes of purge time is adequate to purge many for volumes of the tubing and sample train." **NMED Comment:** The proposed 10-minute purge time is excessive and may result in surface air being pulled into the subsurface at shallow sampling point locations. This situation could result in the collection of soil-vapor samples that are not representative of the formation. Therefore, please revise the Work Plan	Concur. The work plan will be revised to indicate a purge volume of 1 – 3 tubing volumes is adequate.	NO

Attachment 1. Document Review Preliminary Comment Response Table

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				to include purge volumes between one and three more volumes. This was discussed on May 7; KAFB agreed to follow this procedure.		
11	NMED	6-4	6.4	**Permittee Statement:** "An electronic copy of the validated analytical data will be included. The final report will include: • Certification by a facility representative • Executive summary, introduction, and background information • Description of the scope of field sampling activities • Sampling results included in tables with identifier, date and time of all samples. • Tables shall also include quality control/quality assurance designation for each sample • Results of field screening data, in tabular format • Regulatory criteria • Description of vapor point construction and lithologic description • Text summary of data validation procedures and results • Soil boring logs, as an attachment/appendix • Specifications for vapor probe construction, as an attachment/appendix • Survey data, as an attachment/appendix • Waste disposal documentation, as an attachment/appendix • Validated analytical data deliverable in electronic format such as Microsoft Excel, Microsoft Access database, or another compatible format. • Tables, Figures, and Appendices as appropriate • Conclusions and recommendations" **NMED Comment:** Based on prior issues with missing information in submittals, NMED is clarifying what it requires for this and all future submittals. In addition to the information listed above, the permittee is required to include the following: • The response to NMED's comments must be included as Appendix A of each document revision. • Descriptions of all field activities performed for the project must be provided. References to QAPPs, SOPs, or work plans are not	The work plan will be thoroughly reviewed and revised in accordance with all listed NMED comments. • RTCs will be included as Appendix A to the work plan. • Descriptions of all field activities will be included. • Well names will be updated throughout the work plan to match those shown in response to NMED Comment #3. • Sampling data tables will be removed where they have been determined to be extraneous as described in response to NMED comment #5. If data tables remain, they will be updated to show appropriate detection limits, appropriate screening levels, and source document. Instances where data LOQ exceeds the screening level will be called out in figures and tables. Sortable tables will be provided in a separate file (*.xlsx or *.accdb) for ease of review. • All data provided will be accompanied by laboratory deliverables that meet the requirements of Permit Section 6.5.18.2. • Pages, tables, figures, and appendices are all numbered according to the schemes shown in response to NMED Comment #2.	NO

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				acceptable. All deviations from the approved work plan must be discussed and justified in a Deviations section. • Wells must be consistently referred to by the same name/designation and all sections of the text, all tables, and all figures. The designation must match that provided in the digital analytical data files, as well. • Sampling data tables must include the LOQ (PQL) and reporting detection limit for each analysis. • Sampling data tables must include the appropriate screening levels for data comparison. • Analytical data tables in digital format must include a column that indicates which analytical data report the specific sample information can be found. This link must correspond to the analytical data report file name. • Data from analyses where the LOQ exceeds the VISL are data quality exceptions and must be identified as such an all tables and figures. • Analytical data provided in digital format such as Excel or Access files must be provided in a sortable, searchable format. In other words, previous reports have provided digital data in the same format as the tables in the text. These tables are not sortable or searchable. Provide the tables in a standard database format. • Analytical data packages must be submitted in accordance with Permit Section 6.5.18.2, Laboratory Deliverables. • All tables, figures, and appendices must be appropriately numbered and titled. • Every page of every submittal, including all pages within all sections and appendices, must be numbered either sequentially or in some other logical format. This was discussed on May 7; KAFB agreed to follow this procedure.		
12	NMED		App. A	**Appendix A, Historic Benzene Concentrations in off-Base Shallow Soil Vapor Monitoring Points, no page numbers** **NMED Comment:** The Permittee has presented multiple figures with no figure numbers and inaccurate titles in Appendix A, as well as no indication that these	Concur. Appendices will be named correctly and feature sequential page numbers. All tables and figures will be numbered/titled accordingly. In addition, tables and figures that are not directly related to the work being performed under this work plan will be removed.	NO

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				unnumbered pages properly belong in Appendix A or are part of this Work Plan. For instance, each of the five figures in the appendix specify sample locations at 15-25 feet bgs. The first two figures of the appendix show data for samples collected from 25 and 30 feet bgs. The other three figures of the appendix only show data for samples collected from 25 feet bgs. Two of the figures contain a graphed line for "Soil Vapor Monitoring Points Sealed" with no explanation or indication as to the subject of the reference. The tables in Appendix A include similar issues. Based on the data provided in the tables, it appears that there were issues with the data quality. Specifically, the majority of the data presented in the EDB table as nondetect had MDLs and/or LOQs that exceed the screening level, some up to four orders of magnitude. Section 6.5.18 of the KAFB RCRA Permit states, "[a]nalyses conducted with detection limits that are greater than applicable background or regulatory cleanup levels as applicable shall be considered data quality exceptions, and the reasons for use of the elevated detection limits shall be reported to the Department; results based on these data quality exceptions may not be accepted by the Department." The data cannot be used to confirm that concentrations of EDB in soil vapor are below the screening level. This issue potentially masks detections and the data must not be utilized for drawing conclusions or guiding work. The data must be called out in the table (e.g., footnotes, highlighting, etc.). The potential for masking detections must also be discussed in the text of the document in which the data is presented. Also, the appendix title, Historic Benzene Concentrations in off-Base Shallow Soil Vapor Monitoring Points, is not accurate. EDB data is presented in the Appendix, as well. Please provide accurate titles for appendices. The permitting must correct any discrepancies, provide indications of data quality exceptions in tables and figures, provide table and figure numbers, and include sequential, or otherwise logical, page numbers for all pages in the revised Work Plan. This was discussed on May 7; KAFB agreed to follow this procedure.	Extraneous data, including well construction details, purge volumes, historic field measurements, and analytical tables for the entire suite of VOCs, will be removed from the Work Plan. This includes the analytical data tables provided in Appendix A. Where analytical data are still present, data quality will be reviewed and instances where the MDL and/or LOQ exceeds the screening level will be highlighted and/or explained accordingly. If necessary, a brief discussion of masked detections will be added to Section 2.3.	
13	NMED		App. B	**Appendix B, Second Quarter 2019 off-Base Soil Vapor Monitoring Results, inaccurate page numbers**	Concur. Appendices in the work plan will have correct names and feature sequential page numbers. All tables and figures will be numbered/titled accordingly, and extraneous data will be removed.	NO

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COMMENT #	COMMENTER	PAGE # IN DOC.	SECTION #	PERMITTEE STATEMENT/ NMED COMMENT	PROPOSED RESPONSE	CONFERENCE NEEDED WITH NMED?
				NMED Comment: The Permittee has presented multiple tables with inappropriate table numbers and inaccurate footers in Appendix B, as well as no indication that these pages are properly part of Appendix B or part of this Work Plan. In addition, for tables presenting analytical data, as Table 2-3 does, include a column showing the appropriate screening levels to which the data were compared. The tables in Appendix B also contain footnote definitions for terms that are not included. Please remove extraneous information from the tables, add screening level data to the analytical table, and provide appropriate table and page numbers in the revised Work Plan. This was discussed on May 7; KAFB agreed to follow this procedure.		
14	NMED		App. C	**Appendix C, Soil Vapor Monitoring Location Maps and Summary Analytical Results, April - June 2019, inaccurate page numbers** **NMED Comment:** The Permittee has presented figures with inappropriate figure numbers in Appendix C, as well as no indication that these unnumbered pages are properly part of Appendix C or are part of this Work Plan. It is unclear why these figures were included in the Work Plan, because they were only referenced once, but with no discussion or any indication that the permittee utilized them to aid in selection of the proposed soil vapor monitoring points. Please correct the Appendix and provide a discussion of the purpose of the data provided in the Appendix in the revised Work Plan. This was discussed on May 7; KAFB agreed to follow this procedure.	Concur, see response to comments 2, 5, 11, 12, and 13. Appendices in the work plan will be named correctly and feature sequential page numbers. All tables and figures will be numbered/titled accordingly, and extraneous data will be removed. Figures in Appendix C were included to illustrate the relative concentrations of benzene, EDB, and HC measured during recent quarterly events. Several proposed locations were chosen to be collocated with existing SVM locations. These results provide context to the reader of the probable concentration levels to be collected from shallow soil vapor points. This explanation will be added to the revised work plan to ensure clarity to the reader.	NO

References

AECOM, 2020. Memorandum from Junaid Sadeque to John Gillespie with the subject: *Study of '250 ft Clay Layer' in the Vadose Zone of the VA Area Subsurface*, Kirtland Air Force Base, Albuquerque, NM, April.

Interstate Technology & Regulatory Council, 2009. *Evaluating Natural Source Zone Depletion at Sites with LNAPL*. LNAPL-1. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. April. https://www.itrcweb.org/GuidanceDocuments/LNAPL-1.pdf

Kirtland Air Force Base (KAFB), 2018. *Phase I RCRA Facility Investigation Report Bulk Fuels Facility Solid Waste Management Units ST-106/SS-111*. Kirtland Air Force Base New Mexico. August.

KAFB, 2019a. *Quarterly Monitoring Report. April-June 2019 Bulk Fuels Facility Solid Waste Management Unit ST-106/SS-111*. Kirtland Air Force Base New Mexico. September.

KAFB, 2019b. *Source Zone Characterization Report for the Bulk Fuels Facility Solid Waste Management Unit ST-106/SS-111*. Kirtland Air Force Base New Mexico. September.

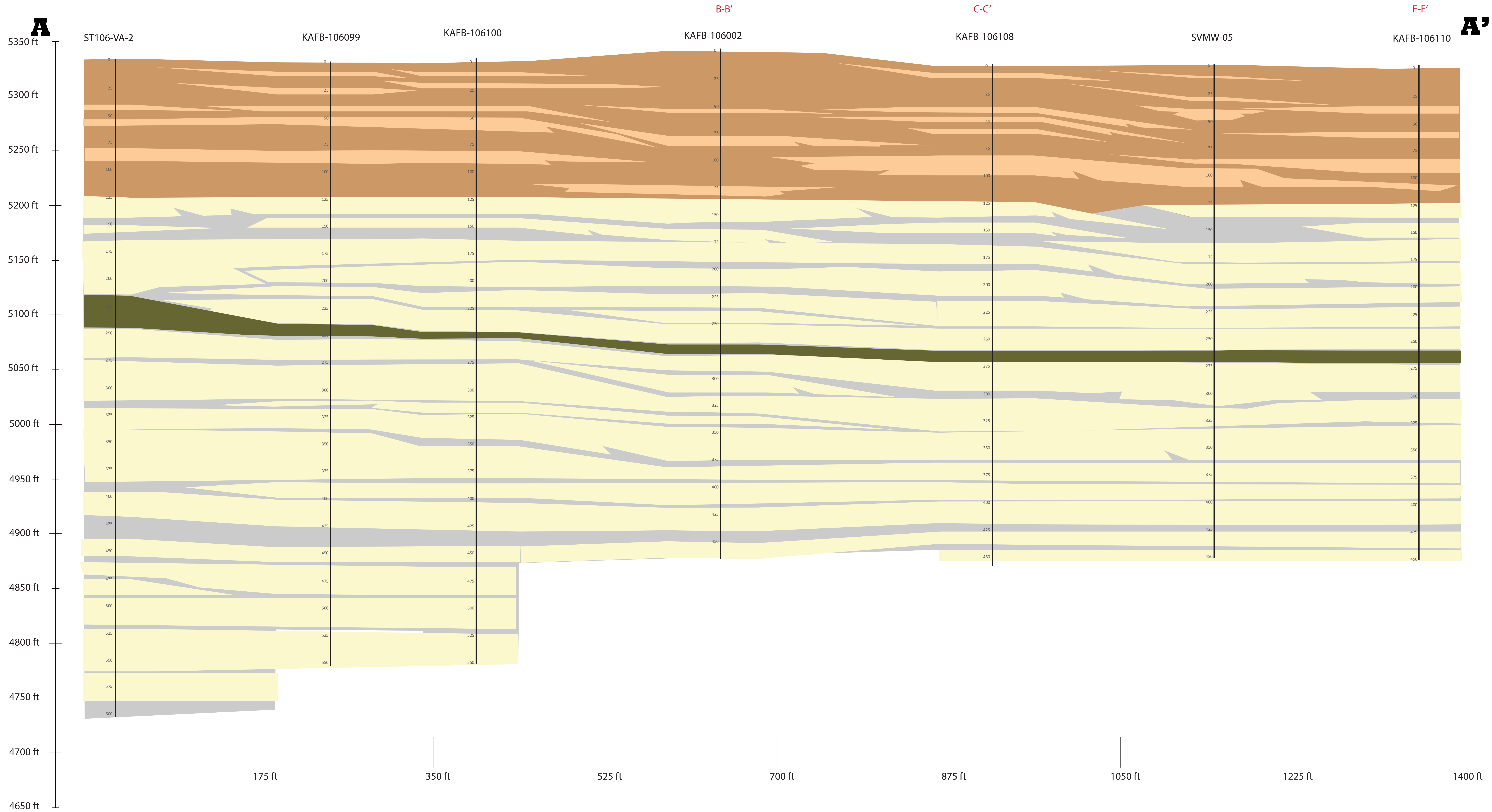
Attachment 1. Document Review Preliminary Comment Response Table

KAFB, 2020. *Quarterly Monitoring Report. October-December 2019 Bulk Fuels Facility Solid Waste Management Units ST-106/SS-111*. Kirtland Air Force Base New Mexico. March.

U.S. Environmental Protection Agency (EPA), 2012. *Conceptual Model Scenarios for the Vapor Intrusion Pathway*. EPA 530-R-10-003. U.S. EPA, Office of Solid Waste and Emergency Response, Washington, DC. February. <https://www.epa.gov/sites/production/files/2015-09/documents/vi-cms-v11final-2-24-2012.pdf>

EPA, 2015. *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*. OSWER Publication 9200.2-154. U.S. EPA, Office of Solid Waste and Emergency Response, Washington, DC. June. <https://www.epa.gov/sites/production/files/2015-09/documents/oswer-vapor-intrusion-technical-guide-final.pdf>

Figure 1. Cross Section of 250-foot Clay Layer from North to South
(Originally Published in AECOM, 2020)



Legend

Facies

- **Coarse-Grained Ancestral Rio Grande Deposits:** Fine to coarse-grained sand, gravel, and sandy gravels deposited in a braided river setting as channel-fills and complex bar deposits.
- **Fine-Grained Ancestral Rio Grande Deposits:** Sandy clay, clayey and/or silty fine-grained sand with some coarse-grained sand deposited in a braided river setting as overbank and still water deposits.
- **"250 Ft. Clay":** Locally continuous clay layer of varing thickness around the measured depth of ~250 ft bgs.
- **Coarse-Grained Alluvial Fan Deposits:** Sand and sandy gravel with some silts deposited in distributary channels and sheet floods.
- **Fine-Grained Alluvial Fan Deposits:** Clayey silts and fine-grained sand associated with interdistributary fan areas. Some calcium carbonate rich zones indicating paleosol hoizons.

AECOM

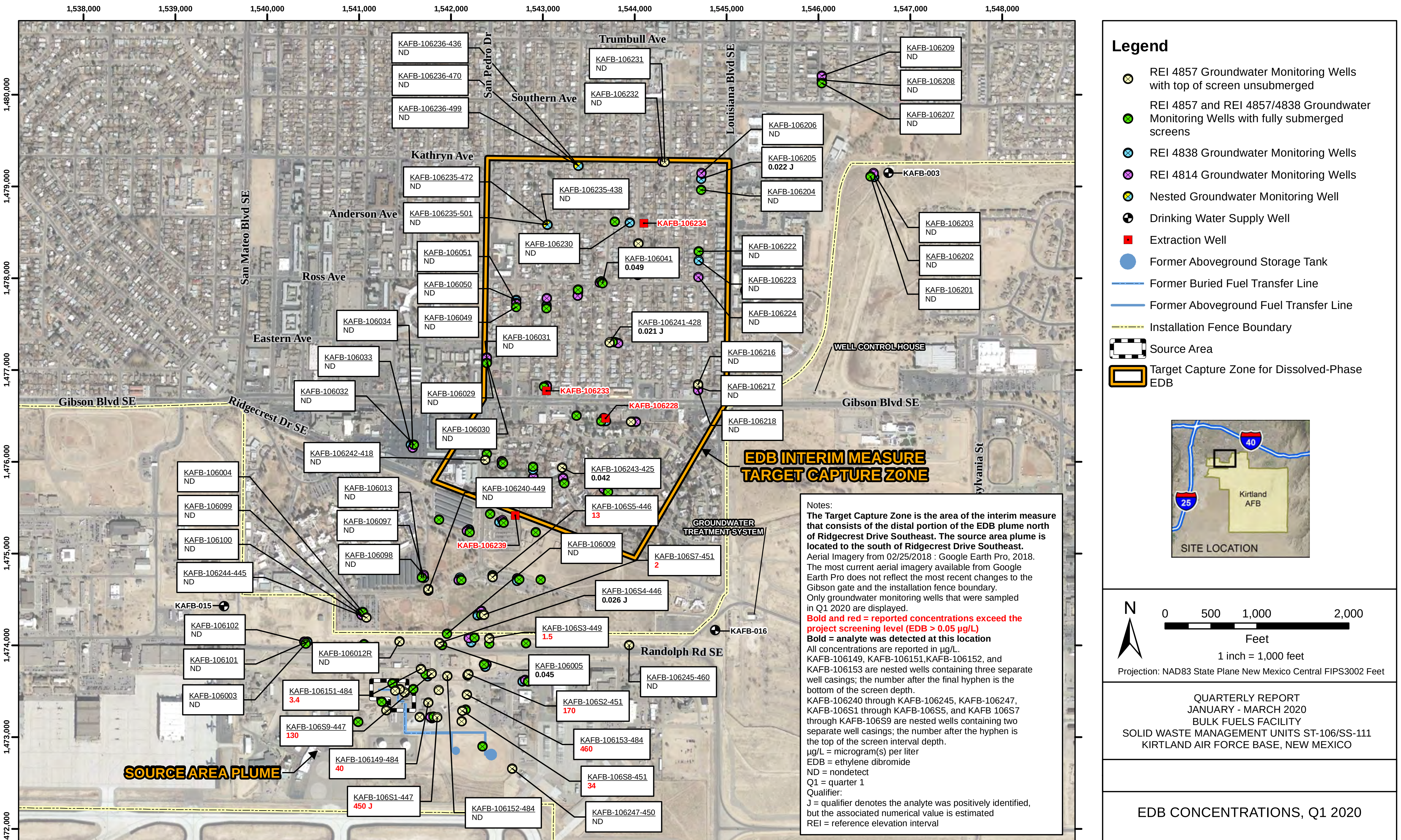
3101 Wilson Blvd, Suite 900
Arlington, VA 22201, USA
T: (703) 528-0103

Cross Section A-A' Stickplot

Kirtland Air Force Base - Albuquerque, New Mexico

PROJECT NO:	PREPARED BY:	DATE:
60607437.04	JS	April 2020

Figure 2. EDB Groundwater Concentrations, Q1 2020
(Originally Published in KAFB, 2020)



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NEW MEXICO
ENVIRONMENT DEPARTMENT

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Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

August 18, 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil engineer Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: REQUEST FOR CLARIFICATION
DISAPPROVAL COMMENT 4
WORK PLAN FOR SHALLOW SOIL VAPOR SAMPLING
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111 KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-19-014

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of the Kirtland Air Force Base (Permittee) July 16, 2020 request for clarification (Request) concerning Comment 4 found in the May 26, 2020 Disapproval of the Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111. In the Request, the Permittee states, "[c]omment 4 does not accurately reflect the administrative record on the Risk Assessment and does not accurately represent the path forward mutually agreed to by NMED and the Air Force as detailed in this letter."

Based upon the contents of the July 16 Request, the Permittee may have interpreted

Comment 4 more broadly than NMED intended. Comment 4 of the May 26, 2020 Disapproval is specifically in reference to the 2017 Risk Assessment associated with the vapor intrusion pathway. The vapor intrusion pathway portion of the 2017 Risk Assessment was not approved by NMED and may not be referenced in the soil vapor workplan nor relied upon in decision-making regarding shallow soil vapor monitoring. During a discussion on May 7, NMED and the Permittee agreed to delay any further effort on the soil vapor risk assessment until the Corrective Measures Evaluation ("CME") phase of the project and acknowledged that, as the final data are processed, previously approved risk assessments may need to be updated during the CME phase based on more recent data. NMED attempted to reflect the May 7 discussion in Comment 4.

I hope this clarifies Comment 4 contained in the May 26, 2020 Disapproval. As a reminder, the Permittee response to the May 26, 2020 Disapproval is due on August 27, 2020. Please reference this clarification correspondence in your response.

Should you have any questions please contact me at (505) 476-6035.

Sincerely,

Kevin Pierard

Digitally signed by Kevin Pierard
Date: 2020.08.18 19:13:51 -06'00'

Kevin M. Pierard, Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
L. Andress, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

NEW MEXICO
ENVIRONMENT DEPARTMENT

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Santa Fe, New Mexico 87505-6313
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Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

August 17, 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil Engineering Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: DISAPPROVAL
SOURCE ZONE CHARACTERIZATION REPORT FOR THE BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNIT ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID # NM9570024423
HWB-KAFB-19-012

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of the U.S. Air Force (Permittee) Kirtland Air Force Base (Facility) *Source Zone Characterization Report for the Bulk Fuels Facility Solid Waste Management Unit ST-106/SS-111* (Report), dated October 2019. NMED has reviewed the Report and hereby issues this Disapproval.

Upon examination of the Report and associated documents, NMED discovered issues with data collection, data analyses, data quality, data presentation, and data interpretation. Therefore, NMED was unable to evaluate the validity of the conclusions presented by the Permittee in the Report. NMED's comments are attached. General topics and several examples of NMED's comments were discussed during a NMED/KAFB conference call on June 18, 2020.

The Permittee must submit a revised Report that corrects the deficiencies noted in this Disapproval. The revised Report must be accompanied by a response letter (also included as an appendix) that details where the comments were addressed and cross-references NMED' s numbered comments. The Permittee must submit a complete electronic redline-strikeout version of the revised Report that shows where all changes were made to the Report. In addition, all PDF versions of documents must be provided in a searchable format. The revised Report must be submitted no later than **December 31, 2020.**

If you have any questions regarding this letter, please contact me at (505) 476-6035.

Sincerely,

Kevin Pierard

Digitally signed by Kevin Pierard
Date: 2020.08.17 15:20:12 -06'00'

Kevin M. Pierard, Chief
Hazardous Waste Bureau

Attachment: NMED Comments

cc: D. Cobrain, NMED HWB
R. Murphy, NMED HWB
L. Andres, NMED HWB
B. Wear, NMED HWB
L. King, EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 and Reading

Attachment 1

GENERAL COMMENTS

1. **Quality Control of document submittals.**

   NMED Comment: Quality control issues identified by NMED in documents previously submitted by the Permittee have also been identified in this Report. Examples include the lack of proper numbering of pages and tables, inconsistencies in the titles of related documents, and the lack of labeling of site features on figures. The Permittee must review its quality control procedures and address these issues to assist NMED in expediting document reviews and to assist the public in better understanding the documents that are submitted by the Permittee. This general topic and several examples of the following general comments were discussed during the NMED/KAFB conference call on June 18, 2020.

2. **Document titles and reporting for remaining scopes of work which were included in the Work Plan.**

   NMED Comment: Several scopes of work were included in the approved Work Plan but not all were addressed in this Report:

   a. The NMED approved June 2017 *Work Plan for Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling, Bulk Fuels Facility, Solid Waste Management Unit ST-106/SS-111* (Work Plan) provides:
      i. the technical approach for the continuous coring for subsurface sample collection, installation of soil vapor monitoring wells for future pilot testing at two of the coring locations, dual-completion of soil vapor/groundwater monitoring wells in eight of the coring locations;
      ii. soil vapor network monitoring and maintenance;
      iii. sampling of the newly installed groundwater monitoring wells and water supply wells; and
      iv. details for the air-lift enhanced bioremediation pilot test.

      The *Source Zone Characterization Report for the Bulk Fuels Facility Solid Waste Management Unit ST-106/SS-111*, dated October 2019, (Report) presents the results of item i and elements of items of ii and iii above: no information on item iv was provided. The Permittee is advised that, in order to avoid confusion, all future work plans must be written for one specific scope of work. No revision necessary.

   b. The title of the Report does not match the name of the relevant scope of work in the Work Plan. This letter pertains solely to the vadose zone coring and associated well installation activities as described in the Report. In order to maintain a clear administrative record, the names of all future documents and scopes of work must not change during the Resource Conservation and Recovery Act (RCRA) corrective action process (i.e., work plans through reports); however, the revised Report must retain its current title to avoid further confusion. No revision necessary. This issue was discussed during the NMED/KAFB conference call on June 18, 2020.

c. Future submittals that report on the activities performed under the Work Plan, must reference the Work Plan in the cover letter and executive summary of the document. Additionally, all future document titles and cover pages must include all major scope activities incorporated within that document, including those presented in appendices. No revision necessary. This issue was discussed during the NMED/KAFB conference call on June 18, 2020.

d. Report revision required. The workplan for the source zone characterization contained multiple scopes of work for various aspects of the study. The Report must clarify where the information regarding the other scopes of work presented in the Work Plan can be found (e.g., data associated with groundwater well gauging and sampling, drinking water and irrigation supply well sampling, and soil vapor monitoring data). The Work Plan discusses data collection for various scopes of work:

i. Section 3.1.5, pages 3-6, 2nd paragraph of the Work Plan states: "Semiannual monitoring of the SVM network was approved...and will include sampling of the entire 284 SVMP network...".

ii. Section 6.2 Project Data Types and Records, page 6-1, 1st paragraph, line 1 of the Work Plan states: "Field data will be collected.....in support of field activities associated with the BFF vadose zone treatability studies including coring, long term SVM, well drilling and installation, drinking water supply...[and]...irrigation well sampling."

iii. Section 6.2.3 Chemical Analytical Data: page 6-2,1st paragraph, line 1 of the Work Plan states: "Chemical analytical data will include sample results from soil, soil vapor, and groundwater samples generated by the lab subcontractors."

The revised report must include a section describing the status of the remaining scopes of work included in the approved Work Plan. Include the date the work was performed and the specific document(s) where the information was reported.

3. Historic high and low water levels at the site

NMED Comment: Report revision required. The historic groundwater levels and present groundwater levels referenced by the Permittee in the Report are not consistently or clearly described in the text. For example:

a. The Work Plan states in Section 3.1.1, page 3-3, 1st paragraph, line 2: "The bottom of the designated coring interval extends approximately 10-20 feet (ft) below the lowest historic water level (2009) to ensure that the deepest vertical LNAPL migration is evaluated.

b. In the Report, Section 5.3, page 5-10, 3rd paragraph, 1st line states: "The highest LNAPL saturation percentage of the collected cores came from KAFB-106S9 at a depth of 484 feet below ground surface (ft bgs)). This is very close to the former lowest ground water elevation from 2009 (approximately 500 ft bgs)."

c. Section 7, page 7-2, 2nd paragraph, 3rd bullet, 2nd line: "...at a depth that coincides with the former lowest groundwater elevation from 2009 (approximately 500 ft bgs)."

d. The approved Work Plan states: "Coring intervals will begin at least ten (10) feet above the 1970s high water mark, which is equivalent to the 1960s high water mark."

Please revise the Report to provide a discussion of groundwater elevation changes over time at the site that includes the dates (month/year) of both the historical high and historical low water levels. Present the historic water levels in both depth below ground surface (ft bgs) and elevation relative to mean sea level (ft amsl) to the nearest 0.01 foot.

4. Laboratory data, laboratory qualifiers, and data presentation

NMED Comment: Report revision required. Quality Assurance (QA) and Quality Control (QC) of laboratory data:

a. The 2010 KAFB Hazardous Waste Facility Permit (Permit), Section 6.5.18, Laboratory Analyses Requirements for all Environmental Media, states "All analytical data (including non-detects, estimated values, and detects) shall be included in the electronic copy of the Investigation Report or other report in Microsoft™ Excel format with any qualifiers as attached from the analytical laboratory." The majority of the laboratory results for soil sampling at the facility presented in Table 5-1 were analyzed by Test America Laboratory. The associated laboratory reports are included as Appendix G-1, however, there are over 50 PDF laboratory reports, each consisting of 600 to 1,200+ individual pages. This format is inconsistent with the Permit requirements which makes it difficult to find specific data and information (e.g., a specific soil sample from a specific boring, at a specific depth, or specific data quality issues for samples associated with a particular laboratory report). The Permittee must revise the Report to provide a Microsoft™ Excel spreadsheet that includes the laboratory data in a searchable format.

This spreadsheet must include a specific field which indicates the laboratory report file name for each sample.

b. Permit, Section 6.5.18.2, Laboratory Deliverables, states "[l]aboratory analytical data packages shall be prepared in accordance with United States Environmental Protection Agency (EPA)-established Level III or IV analytical support protocols" and "[t]he Permittee shall present summary tables of these data and Level II QC results to the Department in reports or other documents...Raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory supporting data for samples from this project, shall be compiled and kept on file at the Facility for reference." The Permittee must revise Appendix G-1, Laboratory Data Packages- Soil Samples, Test America, Inc., to present Level II laboratory report data packages instead of Level IV laboratory report data packages.

c. The December 2017 *Quality Assurance Project Plan for Bulk Fuels Facility Vadose Zone Treatability Studies Solid Waste Management Unit St-106/Ss-111, Revision 1,* (QAPP) was included as an appendix to the Work Plan. Section 4.2 of the QAPP states that data will be validated and flagged with the following data qualifiers: J+, J-, U, UJ, and R. Laboratory case narratives outline numerous concerns resulting in a variety of laboratory data qualifiers which are not included on Table 5-1 or mentioned in text of the Report. For example, the case narrative for associated soil sample V-V2-131218-117 identified three laboratory qualifiers (i.e. J, D, and Q) for the ethylene dibromide (EDB) results for that sample, however, Table 5-1 of the Report shows only a J qualifier. In another example, the case narrative of the laboratory report for total petroleum hydrocarbon (TPH) gasoline range organics (GRO) results for P-V2-121218-080 and P-V2-121218-103 indicates that these samples have been reported with "Q" laboratory data qualifiers which indicate that "One or more quality control criteria failed", however, Table 5-1 of the Report shows only a J qualifier. Please revise the Report to include all laboratory-assigned data qualifiers, including dilution, with footnotes that adequately define the qualifier codes. Data qualifiers must be presented in Table 5-1, and elsewhere in the Report as appropriate.

d. Section 6.5.18.3.1 of the Permit, Laboratory Analyses Requirements for all Environmental Media, states that "[a] full review and discussion of QC data and all data qualifiers shall be submitted with Investigation Reports...". Section 4.2 of the QAPP, Analytical Data Verification and Validation, states "data review findings will be summarized and documented in task-specific data reports, completion reports or with each quarterly monitoring report." The Permittee must include a new section in the revised Report that discusses all data quality concerns and how these concerns may affect the data quality.

e. Table 5-1 indicates that several results are J-coded as a result of the laboratory having to dilute numerous samples prior to analysis due to high contaminant concentrations (e.g.: V-V2-131218-159). The Permittee is reminded that per 6.5.18 of the Permit "[t]he Department will not accept J-coded (estimated) results for samples requiring dilution prior to laboratory analysis." Please revise the Report to indicate that samples diluted prior to analysis will be not be used as decision level data but may be used qualitatively.

f. Laboratory reports indicate that some samples were analyzed outside of the holding time. As a result, the laboratory reports document data validation concerns for these samples. This important information is not included in the Report. The Permittee must revise Table 5-1 to note which samples exceeded holding times and include the applicable laboratory qualifiers on the revised table. Additionally, the Permittee must include an explanation of the issue causing the analysis outside of the holding time and the effect it may have on the data quality, an explanation of any steps taken to resolve the matter, and the results of those efforts in the revised Report. See Comment 4.c above regarding laboratory qualifiers.

g. Table 5-1 only presents analytical results under the column heading for the limit of detection (LOD). The LOD is the lowest analyte concentration at which an analyte can be detected, however, precision and accuracy are not achieved. The limit of quantitation (LOQ) is the lowest concentration at which an analyte can be reliably detected with precision and accuracy. Section 4.3.2, Project-Required Reporting Limits – Sensitivity, in the QAPP of the approved Work Plan indicates that LOQs will be calculated. Laboratory reports show that data is presented with the detection limit (DL), LOD, and LOQ for all analyses performed. Table 5-1 only includes LOD and is therefore not acceptable as presented for the purposes of data reporting. The Permittee must revise the Report to add columns to Table 5-1 to report the DL, LOD, and LOQ for each analysis presented.

SPECIFIC COMMENTS

5. Notice Page

Permittee Statement: "Physical and chemical characterization was performed on residual LNAPL samples."

NMED Comment: NMED Comment: Report revision required. The results of chemical characterization of residual LNAPL from samples collected in 2011 for the Phase I RCRA

Facility Investigation Report, Bulk Fuels Facility Release, Solid Waste Management Unit ST-106/SS-111 are presented in the Report rather than from samples collected as part of the field work implemented under the Work Plan. Please revise the statement for accuracy and revise Table 5-5 to include chemical characterization data performed on residual LNAPL samples collected as part of the field activities covered in this Report or provide an explanation in the revised Report justifying why these data were not collected. The purpose of collecting samples in 2018 was to allow for evaluation of the changing chemical composition of LNAPL in groundwater over time and to calculate new values for the effective solubility of benzene and EDB for estimating the current extent of LNAPL in groundwater. This is important information to obtain due to rising water levels.

6. Executive Summary, page ES-1

Permittee Statement: "The results of this investigation indicate that the presence of fuel has been significantly reduced in the vadose zone by remedial actions and natural processes."

NMED Comment: Report revision required. The Report does not include historical data from source area characterization to compare to the 2018 and 2019 soil, soil vapor, light non-aqueous phase liquid (LNAPL), and groundwater data presented in this Report that would support this statement. The Permittee must include the historical data and provide a discussion to support this statement or remove it from the narrative.

7. Executive Summary, page ES-1

Permittee Statement: "LNAPL saturation in vadose zone samples was highest in the source area and none of the samples were found to contain mobile LNAPL. This demonstrates that there is no drainage of LNAPL that could cause continued LNAPL head in the source area that would be required to drive migration."

NMED Comment: Report revision required. Analysis of multiple geophysical and lithologic logs at the site indicate it is likely that a discontinuous clay layer in the source area may have altered the pathway for the migration of fuels related contamination to groundwater. This potential migration pathway is likely to contain hydrocarbon saturated soils that, while not mobile under current conditions, would likely serve as a significant source of dissolved phase petroleum hydrocarbon contamination as groundwater levels continue to rise and come into contact with them. The lithologic cross sections and the discussion on the site hydrogeology presented in the Report do not address this issue. Revise the Report to address this possibility by identifying the top and bottom surfaces of both the upper and lower clay units beneath the site using cross sections and isopach maps.

8. Section 2 Facility History and Project Background, page 2-1

NMED Comment: Report revision required. The Permittee must revise the Report to include a comprehensive general overview of the site history per reporting requirements outlined in Permit Section 6.2.4.3, Investigation Reports, item number 5, Background Information.

9. Section 3 Scope of Activities, page 3-2

NMED Comment: Report revision required. Laboratory reports included in Appendix G-4 (DBSA Soil Testing Laboratory) include results for Fraction Organic Carbon (FOC). Revise the Report to add an additional bullet to the list on this page that states that FOC testing was conducted and provide the purpose of the tests. Include a table that summarizes the analytical results for FOC, as this is valuable information for use in valuating risk.

10. Section 4.2.1 Groundwater Monitoring Wells, page 4-4

NMED Comment: Report revision required. The Permittee does not discuss well development, gauging, or sampling performed on new groundwater monitoring wells after well installation was complete. This information is essential for a comprehensive characterization of the source area. Revise the Report to include this information in accordance with Permit Sections 6.2.4.3 (Investigation Reports) and 6.5.17.10.8 (Well and Piezometer Completion Reports), see Comment 58, below.

11. Section 5.1 Subsurface Lithology, page 5-1

Permittee Statement: "Soil descriptions from the lithologic logs created during coring activities were used to create detailed geologic models of the subsurface."

NMED Comment: Report revision required. It appears that an incomplete data set was used to generate the model. Cross sections, fence diagrams, and models must be generated using lithologic, soil vapor, and water level data from all the available boreholes and monitoring locations. Failing to do so creates an incomplete picture of subsurface site conditions and may lead to erroneous conclusions regarding the nature and extent of contaminants. Please revise the figures to incorporate both the data collected during the vadose zone coring project and previously collected data.

12. Section 5.1 Subsurface Lithology, page 5-1

Permittee Statements: "Data supplied to this module are based on Unified Soil Classification System (USCS) classifications logged during drilling that were simplified into nine categories reflecting observed grain-size distribution and inferred permeability."

and

"The data used to construct the model are provided in Appendix J."

NMED Comment: Report revision required. The table provided in Appendix J, EVS Model Data does not appear to include most of the model inputs described in the Report. The column headers are not aligned with the data columns and the only units provided (feet and ppb) are both included in a single column. Revise the Report to define all of the parameters in the table and provide appropriate units for each column. NMED notes that Table 5-2, Soil Grain Size Distribution and Classification, contains only eight rather than nine grain-size distribution categories. Please resolve this discrepancy.

Additionally, please revise Appendix J to include the complete data set, data sources, and data quality assurance evaluation used to create the model presented in the Report. This information must include calibrated targets and estimated parameters, parameter distributions and sources of variability, and how each parameter is used in the model. Also include information on model boundary/source conditions, vadose zone and aquifer material properties, and contaminant transport properties. Identify all model assumptions and uncertainties and present the results of the uncertainty and sensitivity analyses in the revised report.

13. Section 5.1 Subsurface Lithology, page 5-1

Permittee Statement: "The subsurface in the area of the Source Zone Characterization project is shown on a west-to-east transect (A-A') and a north-to-south transect (B-B') (Figures 5-1 and 5-2)."

NMED Comments: Report revision required.

a. The Permittee must revise the Report to include a brief discussion of the regional geology and how it is expressed locally at the site.

b. Figures 5-1 and 5-2 contain errors. Please revise the report to correct the following errors:
   - **i.** The X-axis on Figure 5-2 should read "1,474,500" rather than "1,475,500".
   - **ii.** The inset aerial photograph in the Key incorrectly shows the scale of the axes as 2:1 while the scale of the photograph is shown as 1:1.

c. The Permittee must include copies of the field lithologic logs and well completion diagrams as an appendix to the Report.

14. Section 5.1.1 Field Screening, page 5-2

Permittee Statement: "The heated headspace values observed below the water table were indicative of the relative presence of hydrocarbons and were used to guide sample collection. In general, elevated heated headspace values (greater than 100 milligrams per kilogram) were observed predominately in the saturated zone (Table 4-1)."

NMED Comment: Report revision required. The Permittee's summary of heated headspace field screening lacks the necessary level of detail given its use in guiding sample collection for laboratory analyses. Please revise the discussion to provide a more complete summary of the heated headspace field screening results, including the increasing and decreasing trend in heated headspace readings followed by another increase at depth in heated headspace readings, which correspond to historical water levels at the Site. Additionally, PIDs typically give a response in units of parts per million by volume (ppmv). In heated headspace screening, the concentration in the headspace, measured in ppmv, does not equal the soil or water concentration, measured in mg/kg or mg/L. Correct the units in the revised report.

15. Section 5.2.1 Analytical Results for Organic Compounds, Vadose Zone, page 5-2:

Permittee Statement: "Concentrations of TPH, BTEX, and EDB are below the laboratory reporting limit in the vadose zone in all other boreholes (Figures 5-3 through 5-5, Table 5-1)."

NMED Comment: Report revision required. Soil coring was to be completed within set temperature parameters (≤ 20° Celsius) regardless of whether collection of a soil sample was planned for any given interval. On November 2, 2018 the Permittee requested via electronic mail a variance from meeting the temperature requirement for samples collected above 450 ft bgs for borings KAFB-106S2, KAFB-106S3, KAFB-106S6, KAFB-106S7, KAFB-106S8, and for samples above 400 ft bgs for boring KAFB-106S1. NMED approved the request on November 5, 2018 without comment. The Permittee's presentation of the analytical results for organic compounds in Section 5.2.1 fails to address their inability to meet the Work Plan requirement for completing sonic coring within set temperature parameters (≤ 20° Celsius). The Report must be revised to include a description of the process for measuring the core temperature and a discussion on the uncertainties associated with the temperature measurements. The Permittee must discuss the impact of elevated core temperatures on PID readings, sample integrity, and representativeness of the laboratory analytical results. The Permittee must include temperature data in appropriate tables. For example, Table 4-1 and Table 5-1 must have a column that displays the core temperature for each PID result or analytical sample. Lab analytical samples must be flagged for any sample that was collected above ≤ 20°Celsius. This issue was discussed during the NMED/KAFB conference call on June 18, 2020.

16. 5.2.1 Analytical Results for Organic Compounds, page 5-2

Permittee Statement: "For the purposes of this report, only results for the primary contaminants of concern BTEX, EDB, and TPH are discussed."

NMED Comment: Report revision required. Clarify why analyses for 61 other constituents is not discussed in the Report. Revise the Report to include a discussion of the other constituents listed in Table 5-1 and provide an explanation for excluding certain analytes.

17. 5.2.1 Vadose Zone Summary, page 5-2

Permittee Statement: "Concentrations of BTEX, TPH, and EDB were elevated in the samples collected from KAFB-106V1 and KAFB-106V2 (Figures 5-3 through 5-5, Table 5-1)."

NMED Comment: Report revision required. The Permittee's subsequent discussion addresses only KAFB-106V1. The Vadose Zone Summary must also include a discussion of organic compound trends in well KAFB-106V2. A discussion of the physical and interstitial properties of the stratigraphic intervals that control the migration and occurrence of the organic compounds in the vadose zone must be included in the revised report.

18. 5.2.1 Vadose Zone Summary, page 5-2

Permittee Statement: "The clay unit at these wells [KAFB-106V1 and KAFB-106V2] is very stiff to hard and contained up to 40 percent (%) silt."

NMED Comment: Report revision required. The source of the data for Permittee's statement must be included. The boring lithologic log for KAFB-106V1 indicates a maximum silt content of 10% in the clay layer. The boring lithologic log for KAFB-106V2 indicates a maximum silt content of 40% in the clay layer. Analytical data in Table 5-2 Soil Grain Size Distribution and Classification does not provide particle size distribution data for the clay layer at any of the boring locations. None of the analytical data presented in the Report includes measurements of sample stiffness or hardness. If the source of the data in the Permittee's statement is from the field borehole lithologic logs, the data must be reported in Section 5.1, Subsurface Lithology, rather than in Section 5.2, Laboratory Analytical Results. Please revise the Report for accuracy.

19. 5.2.1 Vadose Zone Summary, page 5-2

Permittee Statement: "Concentrations of BTEX, TPH, and EDB decrease significantly below the clay to the total depth of KAFB-106V1 at 285 ft bgs. Concentrations of TPH, BTEX, and EDB are below the laboratory reporting limit within the vadose zone in all other boreholes."

NMED Comment: Report revision required. The Permittee's statement is not supported by the data reported in Table 5.1. The table indicates elevated total petroleum hydrocarbons-diesel range organics (TPH DRO) and TPH GRO concentrations starting at a depth of 459' bgs in well KAFB-106S1. Concentrations for both analytes increase with depth to over 3000 milligram per kilogram (mg/kg) at a depth of 489' bgs. Depth to water (DTW) for KAFB-106S1 is recorded at 492' bgs in the boring log header and well construction diagram. Based on a DTW of 492' bgs, the elevated concentrations are within the vadose zone and both screened intervals of the well are above the water table.

NMED notes that the reported DTW at KAFB-106S1 is substantially greater than at any other ground water monitoring well. For instance, at nearby well KAFB-106S8, DTW is approximately 476' bgs. The anomalous DTW measurement at KAFB-106S1 must be corrected or explained. The Permittee must review the water level data and all related analytical data for all boreholes and revise the Report for accuracy.

20. 5.2.1 Saturated Zone Summary, page 5-3

Permittee Statement: "In wells located off-Base, toluene was the only constituent detected in KAFB-106S5 (farthest from source area) at concentrations of 0.00091 milligrams per kilogram (mg/kg) (417 ft bgs) and 0.00094 mg/kg (467 ft bgs)."

NMED Comment: Report revision required. The Permittee must identify the off-base wells. Additionally, Table 5-1 indicates that TPH DRO was detected at 5.6 mg/kg at a depth of 467 ft bgs at boring KAFB-106S5. Please revise the statement for accuracy.

21. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-4

Permittee Statement: "The highest LNAPL saturation from the vadose zone sample was observed in KAFB-106V1 at a depth of 122 ft bgs...".

NMED Comment: Report revision required. No percentage is provided to compare with the ranges of LNAPL saturation results stated in the previous paragraphs. The Permittee must add the value for percent pore volume for KAFB-106V1 at 122 ft bgs to this sentence.

22. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-4

Permittee Statement: "The percentage of LNAPL saturation decreases away from the source area (KAFB-106V1 and KAFB- 106V2). The highest LNAPL saturation in the saturated zone was found in KAFB-106S9 at a depth of 484 ft bgs (Table 5-4). The lowest LNAPL saturations KAFB-106S5 and KAFB-106S7, which are the farthest wells from the source area..."

NMED Comment: Report revision required. The Permittee must add the percentages of LNAPL saturation to this sentence for comparison purposes and reference the table that presents this information.

23. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-4

Permittee Statement: "Soil grain distribution and classification was analyzed on 16 soil samples (six vadose zone and 10 saturated zone), along with 14 interstitial analyses of soil samples (six vadose zone and eight saturated zone)."

NMED Comment: Report revision required. NMED identified multiple problems with the data and discussion for Section 5.2.2 that make it difficult to evaluate the information presented by the Permittee. The tables and associated discussions must be revised for accuracy and the section rewritten. This issue was discussed during the NMED/KAFB conference call on June 18, 2020.

a. Table 5-3, Lithology and Interstitial Properties of Selected Core Samples, indicates that interstitial properties (total porosity, air filled porosity, pore fluid water saturation, and pore fluid LNAPL saturation) were determined for 16 rather than 14 samples. Resolve the discrepancy.

b. The sample depth column for Table 5-2 reports a depth range for some samples and a single depth for other samples. Explain the difference in the reported sampling intervals and explain how a representative particle size distribution for a 2-foot-long core sample was determined for samples where only a single depth is given. Explain why sample sizes listed in Table 5-4 range from 1/10 foot to 2 feet.

c. A description of the rationale for selecting discreet samples from core samples and at least two examples of the process must be provided in the discussion in Section 5.2.2. Compare the rationale for selecting a discreet sample from cores that fluoresced under ultraviolet (UV) light to cores that did not fluoresce.

d. Table 5-2 reports particle size distribution data and a corresponding United Soil Classification System (USCS) name. Sample GUV-S9-171018-473 is given a USCS classification of well graded sand. The particle size distribution data reports the sample as having 56.67 weight percent (wt.%) gravel 4.0 wt% coarse sand, 17.29 wt% medium sand, 18.97 wt% fine sand, and 3.07 wt% silt/clay. According to the USCS code the sample should be classified as a sandy gravel rather than a well graded sand. All such discrepancies in Tables 5-2 must be identified and corrected.

e. Issues were identified with the PTS Laboratories Physical Properties Data presented in Appendix G-2. For example, PTS File No: 48218 includes two samples, identified on some pages of the data sheets as GUV-S9-171018-473 and GUV-S9-181018-484 and on other pages as GUV-S9-171018-473 and GUV-S9-181018-474. Review the PTS lab data for accuracy. The Report must be revised to remove data, discussions, conclusions, and recommendations that are based on lab data that fails to meet data quality objectives.

f. NMED has identified discrepancies in the lithologic descriptions for samples reported in Tables 5-2, 5-3, and 5-4. For example, sample GUV-S5-231018-488 is described in Table 5-3 as a well graded sand with gravel while in Table 5-4 it is described as coarse sand. Aside from the descriptions being different, a well graded sand should contain a range of sand sizes rather than coarse sand only. All such discrepancies in Tables 5-2, 5-3, and 5-4 must be identified and the Report revised accordingly. The following are examples of some of the discrepancies identified:

   i. The PTS Laboratories sieve analysis results in Appendix G-2 report that sample GUV-S4-041118-486 is classified as a medium sand. Table 5-4 lists the soil type for the sample as fine sand. Resolve the discrepancy.
   ii. The PTS Laboratories sieve analysis results in Appendix G-2 report that sample GUV-S2-161118-489 is classified as fine sand. Table 5-4 lists the soil type for the sample as fine sand. Table 5-2 lists the sample as well graded gravel with sand. Resolve the discrepancy.
   iii. The PTS Laboratories sieve analysis results in Appendix G-2 report that sample GUV-S3-211118-494 is classified as gravel. Table 5-4 lists the soil type for the sample as gravel. Table 5-2 lists the sample as clay. Resolve the discrepancy.
   iv. The PTS Laboratories sieve analysis results in Appendix G-2 report that sample GUV-V1-161219-164 is 91 wt% fine sand. Table 5-2 lists the sample as clay. Resolve the discrepancy.

g. Appendix G-2 appears to contain duplicate Chain of Custody Record forms for individual samples. Remove the duplicate forms from Appendix G-2 or provide an explanation for retaining them.

h. Sample GUV-S7-220119-492 is attributed to coring location KAFB-106S7 in table 5-3, but it is attributed to coring location KAFB-105S7 in Table 5-4. Resolve the discrepancy.

i. The PTS Laboratories Chain of Custody Record for sample GUV-S5-231018-488 indicates that grain size distribution data was one of the analyses requested. Grain size distribution data for the sample is not presented in Table 5-2 of the Report and the footnotes for Table 5-3 indicate that the lithology description for the sample was obtained from logs. Explain why the log description was used rather than the laboratory analysis. Also, the PTS Laboratories data sheets for grain size distribution, interstitial properties, and fluid properties for the sample could not be located in Appendix G-2. All of the laboratory data for the sample must be provided in the revised Report or the sample must be excluded from the Report.

j. The Permittee states in Section 3 that the intensity of core sample response to UV light provided an approximation of the relative amount of LNAPL present in the soil and that this was used to select sample locations for further laboratory LNAPL analysis. The photo of core sample GUV-V2-131218 at a depth of 214-215 ft bgs appears to display the most intense response to UV light of any of the samples evaluated yet the Permittee did not select the sample for LNAPL analysis. Provide justification for not conducting LNAPL analysis on this sample.

24. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-4

Permittee Statement: "For the purpose of assessing the location of LNAPL in the saturated zone, the more conservative effective solubility concentration of 1.43 milligrams per liter (mg/L) benzene is used as a line of evidence of potential LNAPL occurrence."

and

"Using the effective solubility concentration of 1.43 mg/L, the location of submerged LNAPL was approximated by locating this concentration isocontour on the benzene concentration map. Figure 5-7 shows the approximate location of LNAPL as superimposed on the [second quarter of 2019 sampling event] Q2 2019 benzene isocontour map (reference elevation interval 4857)."

NMED Comment: Report revision required. Figure 5-7, LNAPL-Filled Porosity from Continuous Coring, depicts the outline of the dissolved benzene plume where concentrations exceed the EPA maximum contaminant level (MCL) of 5 ug/L in groundwater rather than the contour for the effective solubility concentration of benzene 1.43 mg/L. Also depicted in the figure is an outline of the estimated extent of LNAPL/residual LNAPL in groundwater. The Permittee must clarify in the legend of Figure 5-7 if this contour is equivalent to the effective solubility of benzene (1.43 mg/L), if it is not, revise Figure 5-7 to show the isocontour for 1.43 mg/L benzene. Furthermore, it is not clear what data was used to create the LNAPL outline. The Permittee's statement refers to using the effective solubility concentration of 1.43 mg/L to construct the LNAPL isocontour however, the well identification numbers and analytical data used to construct the contour have not been provided. The Permittee must also revise the legend of Figure 5-7 to indicate the source of the data used to create the LNAPL isocontour and provide a table that identifies the wells, date of collection, and concentration data used to create the LNAPL isocontour.

25. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-5 and 5-7

Permittee Statement: "Figure 5-7 indicates that the BTEX plume biodegrades within a relatively short distance (less than 500 ft) from the residual source and is fully attenuated before it reaches Ridgecrest Drive."

and

"Based on these data, it does not appear that biodegradation of EDB or BTEX can occur at significant rates at these sample locations [KAFB-106S7, KAFB-106S8, KAFB-106247]."

NMED Comment: Report revision required. The Permittee must revise the Report to include lines of evidence to demonstrate that biodegradation is the mechanism by which the BTEX plume is attenuated and resolve the discrepancy between the two conclusions presented in the statements above regarding biodegradation of the BTEX plume.

26. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-4

Permittee Statement: "LNAPL samples collected from KAFB-106006 (alias KAFB-1066) and KAFB-106076 (alias KAFB-10676) in 2011 were used to calculate the effective solubility of BTEX in both samples (Kirtland AFB, 2018a). Solubility values from NMED guidance (NMED, 2019f) were used to calculate the molar fractions for each constituent. The effective solubility of BTEX (average of ortho-, meta-, and para-xylenes) in KAFB-106006 was calculated to be 6.44, 17.25, 1.03, and 1.37 milligrams per liter (mg/L), respectively. The effective solubility of BTEX in KAFB- 106076 was calculated to be 1.43, 6.89, 0.78, and 0.94 mg/L, respectively (Table 5-5)."

NMED Comment: Report revision required. This issue was discussed during the NMED/KAFB conference call on June 18, 2020.

a. The Permittee states that the solubility in water and effective solubility values for benzene are taken from the 2018 *Phase I RCRA Facility Investigation Report, Bulk Fuels Facility Release, Solid Waste Management Unit ST-106/SS-111* (2018 RFI), a document that has not been approved by NMED. The 2018 RFI, page 5-4, lines 24-27, reports the following values for benzene: solubility in water=1,780 mg/L; effective solubility= 1.494 mg/L at KAFB-106006; and effective solubility=6.408 mg/L at KAFB-106076. These values are different than what is presented in the discussion and in Table 5-5. Resolve the discrepancy.

b. NMED notes that the 2018 RFI, page 5-4, lines 28-31, states "It is important to note that additional LNAPL samples may yield additional effective solubilities for benzene that could be higher or lower than those yielded by the two collected LNAPL samples. The original composition of the LNAPL, and the degree of degradation, will both affect the mole fraction of benzene in each sample. These effective solubilities represent only one line of evidence indicating where residual LNAPL remains in the saturated zone." This statement identifies important uncertainties regarding the use of LNAPL samples from 2011 to calculate the effective solubility of benzene and, in turn, to estimate the current extent of LNAPL/residual LNAPL in water. The Permittee must revise the Report to identify the uncertainties associated with using LNAPL samples from 2011.

27. 5.2.2 Light Non-Aqueous Phase Liquid Saturation, Mobility, and Effective Solubility, page 5-5

Permittee Statement: "...exceeded the benzene standard of 5 µg/L ranging from 0.2 to 26,000 µg/L...Figure 5-6."

NMED Comment: Report revision required. The Permittee must add additional text to this section describing how many wells were sampled and where the wells with the highest concentrations are located.

28. Section 5.2.4 Microbial Analysis pages 5-7 and 5-8

Permittee Statement: "In general, concentrations of bacteria associated with potential EDB degradation in soil samples collected in 2018 were moderate... Concentrations of various well-studied reductase enzymes (including ethylene dichloride reductase) were not detected in any samples, and enzymes associated with aerobic cometabolic degradation of EDB during aerobic metabolism of BTEX (phenol hydroxylase and two toluene monooxygenases) were detected in significant numbers in five samples (collected from KAFB-106S1, KAFB-106S2, KAFB-106S3, KAFB-106S4, and KAFB-106S9)."

NMED Comment: Report revision required. Provide information or context on what constitutes "moderate" concentrations of bacteria or "significant number" of enzymes associated with aerobic cometabolic degradation of EDB during aerobic metabolism of BTEX. Revise the Report to include a table and discussions that provide a quantitative comparison of the data presented in the Report to an appropriate standard. Incorporate information on sample depth relative to the water table, lithology, and location relative to the submerged LNAPL plume.

29. Section 5.2.5 Moisture Content, page 5-8

Permittee Statement: "The results of the moisture analyses are shown in Tables 5-7 and 5-8 and in Appendix G-4."

a. **NMED Comment:** Report revision required. Table 5-7, Summary of Soil Analytical Moisture Content, lists the USCS lithology classification for each sample. It is unclear how the soil data in the USCS column corresponds to the data in the other columns. Revise the table to clearly attribute the appropriate soil type to each individual sample. The issues identified with the reporting of PTS Laboratories soil data in Tables 5-2, 5-3, and 5-4 also affects Table 5-7. Please revise all Tables containing USCS data to consistently report accurate USCS classifications for the samples.

b. **NMED Comment:** Report revision required. Table 5-7 reports percent moisture content and percent LNAPL for soil samples but provides no information as to what the percentage values refer to, such as percent pore volume or percent bulk volume. Revise Table 5-7 to indicate what the percentage values refer to.

30. Section 5.2.5 Moisture Content, page 5-8

Permittee Statement: "Moisture analyses were performed by American Society for Testing and Materials (ASTM) International D2216 (ASTM International, 2005) for geotechnical, TPH, EDB, and [volatile organic compounds] VOC analyses."

NMED Comment: Report revision required. ASTM International Test D2216 is a test for determination of the water (moisture) content by mass of soil, rock, and similar materials, not a test method used for geotechnical, TPH, EDB, and VOC analyses. Please revise the statement for accuracy.

31. Section 5.2.5 Moisture Content, page 5-8

Permittee Statement: "The moisture content ranged from 1.3 to 33.8 wt.% for the analyzed samples. The moisture content results and corresponding USCS classification for the samples are summarized in Table 5-7."

NMED Comment: Report revision required. Table 5-7 reports percent moisture content and percent LNAPL for soil samples but does not provide information as to what the percentage values refer to, such as percent pore volume or percent bulk volume. Please revise Table 5-7 accordingly.

32. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-9

Permittee Statement: "The vapor plume model was interpolated using a kriging method assuming a very low horizontal to vertical anisotropy (3 to 1). The very low anisotropy range (typical is 30 to 1) was selected because of the gravity dominated flow of the release. A lower value was not used because it resulted in isolated plumes with no constraint in between borehole locations, which is not considered reasonable."

NMED Comment: Report revision required. Model assumptions such horizontal to vertical anisotropy and gravity dominated flow must be based on empirical data acquired from the site. Please revise the Report to provide justification for the anisotropy ratio and for the modeling assumption that gravity dominated flow is consistent throughout the vadose zone. Discuss differences in anisotropy that may exist between the alluvial piedmont deposits and the Upper Santa Fe Group deposits.

33. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-9

Permittee Statement: "The vapor plume was then illustrated using an arbitrary iso-shell value of l00,000 micrograms per cubic meter. Model results are presented on Figures 5-8 through 5-14 and are discussed below."

NMED Comment: Report revision required. The term "iso-shell" must be defined. Based on the color bar representing BTEX concentrations in soil vapor and the depictions of the BTEX vapor plume in Figures 5-8 through 5-14, it appears that the Permittee used an "iso-shell" value of 10,000 micrograms per cubic meter rather than 100,000 micrograms per cubic meter as a cutoff value to define the boundary of the BTEX plume. Revise the figures and discussion to resolve the discrepancy.

34. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-9

Permittee Statement: "Subsurface geology (sands and gravels) was the dominant control for the downward migration of the release."

NMED Comment: Report revision required. The dominant control for the downward migration of the release was the continuous, extended release of fuel to the subsurface which provided the hydraulic head necessary to drive migration. The dominant control for the contaminant migration pathway was the subsurface geology. Please revise the statement for accuracy.

35. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-9

Permittee Statement: "The lack of significant soil vapor hydrocarbon results directly above these shallow clay units laterally from the source area suggests that LNAPL maintained a near vertical migration pathway through higher permeable areas around, as well as through the clays. This indicates that LNAPL migration was dominated by gravity drainage rather than horizontal migration along low permeability (i.e., clay or silt) zones."

a. **NMED Comment:** Report revision required. The Permittee makes a comparison of a physical process (gravity drainage) relative to horizontal migration. It is not clear how gravity drainage, migration direction, and permeability relate to one another in this example or why gravity drainage is considered the dominant factor for LNAPL migration. Revise the statement for clarity.

b. **NMED Comment:** Report revision required. In the discussion of downward migration of the contaminant plume the Permittee refers to shallow clay layers and deeper clay layers but provides no information on the different characteristics of the shallow versus deep clay layers to support the conclusions presented in the discussion. The Permittee must differentiate between the shallow and deeper clay layers by including in the discussion, at a minimum, information on the depositional environment, bed geometry and thickness, lateral continuity, and physical and interstitial properties.

36. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "At that point, mobile LNAPL migrated northward on the groundwater in response to LNAPL head resulting from continued loading from the ongoing release (Figure 5-10)."

NMED Comment: Report revision required. Figure 5-10 does not clearly depict LNAPL. Revise Figure 5-10 to clearly depict LNAPL.

37. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "Figure 5-11 shows the residual LNAPL (smear zone) to be approximately 40 ft thick in the source area (KAFB-106S9) and thins to approximately 25 ft thick toward the south (KAFB-106S1) and less than 10 ft thick to the north (KAFB-106S5)."

NMED Comment: Report revision required. Figure 5-11 must be modified to include a north arrow. Also, the figure depicts multiple isolated LNAPL bodies below the water table without explanation. Revise the Report to add a north arrow to all figures and include a discussion on the significance of the isolated LNAPL bodies depicted in Figure 5-11. Clarify whether all the LNAPL bodies are included in the estimation of the LNAPL smear zone thickness.

38. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "Laboratory results during coring operations indicate elevated concentrations of adsorbed hydrocarbons at elevations that most likely relate to the local groundwater elevation steps."

NMED Comment: Report revision required. Provide lines of evidence to support the statement. Revise the discussion and provide a table that describes the number and depths of the elevation steps, the source of the data, the related laboratory results, and corresponding lithologies.

39. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "Partitioning of benzene from residual LNAPL where the vadose zone source intersected the groundwater table serves as a continuing source of dissolved contamination."

NMED Comment: Report revision required. This statement must differentiate between past, current, and predicted vadose zone / groundwater table intersection. Please revise the statement for clarity and address submerged LNAPL in the discussion of continuing sources of dissolved contamination.

40. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "The dissolved phase benzene plume is shown in map view on Figure 5-12."

NMED Comment: Report revision required. The referenced figure must include clear contaminant contour lines. Also, please clarify if this figure represents soil vapor or groundwater data. The Legend and Notes contradict each other. Revise figure 5-12 for clarity.

41. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "The soil vapor plume in the vadose zone is shown on Figure 5-13."

NMED Comment: Report revision required. Figure 5-13 depicts a lone pocket of BTEX vapor to the west of KAFB-106S3 with no associated monitoring points to identify the source of these data. It is difficult to estimate the concentration of this pocket of BTEX soil vapor with the scale provided in the Legend of the figure. Discuss this anomaly, including its concentration and depth in the text of the revised Report.

42. 5.3 Light Non-Aqueous Phase Liquid and Fuel Hydrocarbon Spatial Distribution, page 5-10

Permittee Statement: "Figure 5-14 shows that the highest dissolved phase benzene concentrations are located where the soil vapor plume intersects the groundwater plume, demonstrating that the soil vapor and dissolved vapor data are in alignment."

NMED Comment: Report revision required. Figure 5-14 does not clearly illustrate this concept as data points appear to be omitted from the figure. Please revise the figure to clearly depict the relationship between the soil vapor plume and groundwater plume.

43. Section 6 Investigation Derived Waste, page 6-1

Permittee Statement: "Information regarding investigation-derived waste accumulation and storage, utilization of the Kirtland AFB groundwater treatment system, and other investigation-derived waste processes are described in more detail in the following reports generated for the BFF..."

NMED Comment: The Report contains no information on how the IDW was containerized, transported, characterized, stored, or disposed of. Appendices F-1 through F-4 contain tables but no descriptions of procedures. The Permittee may not refer to separate documents and must include all IDW information relevant to this scope of work as an appendix in the revised Report.

44. Section 7 Summary and Conclusions, page 7-1

Permittee Statement: "The source zone characterization included coring at 11 locations to assess the horizontal and vertical extent of LNAPL at the Site... the collection of over 3,600 linear ft of core, chemical analysis of 87 soil samples, UV fluorescence of 30 cores... Soil core samples were collected to obtain contaminant concentration and soil and LNAPL properties data."

NMED Comment: Report revision required. Please provide the results of these data on cross sections or fence diagrams so that a direct comparison can be made of the lithology and the locations of samples, LNAPL, and UV detections found through field screening and laboratory analyses.

45. Section 7 Summary and Conclusions, page 7-1

Permittee Statement: "Continuous cores were collected next to existing boreholes using sonic drilling to provide higher resolution lithologic data in the source area. The logs from the new cores were then compared to the logs from the existing boreholes."

NMED Comment: Report revision required. The cross sections in the Report do not reflect this higher resolution data and are presented in a different style than those presented in the Work Plan. Please revise the Report to present the data in a format that allows a comparison of the data from the new cores to the data from the pre-existing boreholes.

46. Section 7 Summary and Conclusions, page 7-1

Permittee Statement: "The SVM wells were installed as observation wells for the bioventing pilot study that initiated in 2018."

NMED Comment: Report revision required. Please cite and reference the specific documents in which the information related to the bioventing pilot study was submitted to NMED.

47. Section 7 Summary and Conclusions, page 7-1

Permittee Statement: "Soil samples were collected from drill cuttings and soil cores and then submitted to an analytical laboratory for TPH GRO/DRO/MRO, VOC, and EDB analysis."

NMED Comment: Report revision required. Please identify which soil samples were collected from drill cuttings and sent to analytical laboratories for analysis. Samples collected for investigation derived waste (IDW) analyses may be excluded.

48. Section 7 Summary and Conclusions, page 7-1

Permittee Statement: "Evaluation of the data collected from LNAPL testing provided the following conclusions:"

NMED Comment: Report revision required. This statement appears to be a typographical error. Concentrations of TPH, BTEX, and EDB rather than LNAPL are discussed in the bulleted paragraphs that follow. LNAPL is discussed in a separate section on page 7-2. Please revise the Report to correct the discrepancy.

49. Section 7 Summary and Conclusions, page 7-1

Permittee Statement: "These concentrations increased with depth until a clay unit that was encountered at a depth of approximately 265 ft bgs. Below this clay unit, concentrations decrease significantly (Figures 5-3 through 5-5)."

NMED Comment: Report revision required. Figures 5-3 through 5-5 do not depict lithology and the cross sections provided in Figures 5-1 and 5-2 are insufficient for correlating this information. Please revise the Report to provide adequate cross sections that depict the information presented in the discussion.

50. Section 7 Summary and Conclusions, page 7-2

Permittee statement: "The highest LNAPL saturation from the vadose zone is in KAFB-106V1 at a depth of 122 ft bgs (Table 5-4). The highest LNAPL saturation in the saturated zone was observed in KAFB-106S9 at a depth of 484 ft bgs (Table 5-4). The lowest LNAPL saturations are in wells KAFB-106S5 and KAFB-106S7, which are located off-Base, farthest from the source area (Table 5-4)."

NMED Comment: The revised report must include a figure and/or cross section that illustrates this statement. The figure must clearly depict lithology, LNAPL saturation, current and former groundwater levels, and clearly identify relevant boring locations. See Comment 14.

51. Section 7 Summary and Conclusions, page 7-2

Permittee Statement: "The LNAPL migrated as far north as Bullhead Park, and this was observed in the residual saturation data."

NMED Comment: Report revision required. Bullhead Park is not identified on any of the figures presented in the Report. Please revise the Report to ensure all geographical features and locations referenced in the text of the Report are identified on all relevant figures.

52. Section 7 Summary and Conclusions, page 7-2

Permittee Statement: "The highest LNAPL saturation from the vadose zone is in KAFB-106V1 at a depth of 122 ft bgs (Table 5-4). The highest LNAPL saturation in the saturated zone was observed in KAFB-106S9 at a depth of 484 ft bgs (Table 5-4). The lowest LNAPL saturations are in wells KAFB-106S5 and KAFB-106S7, which are located off-Base, farthest from the source area (Table 5-4)."

NMED Comment: Report revision required. Please revise the Report to add a figure that clearly depicts the spatial context of LNAPL saturation within the site and identify all relevant boring identification numbers, sample depths, groundwater depths at the times of investigation, and historical low and high groundwater depths.

53. Section 7 Summary and Conclusions, pages 7-2 and 7-3

Permittee Statements: "No microbial genes responsible for reductive dehalogenation were found in samples collected."

"No Dehalococcoides, the only bacteria known to be capable of complete reductive dehalogenation to ethane, were found in any of the samples."

and

"Abiotic attenuation of EDB with respect to iron-bearing minerals is not anticipated to be significant."

NMED Comment: Report revision required. Please revise the Report to discuss the presence or absence of bacteria and/or minerals that could have affected the degradation of site-specific contaminants of concern. This will serve to simplify Sections 5.2.3, Mineralogy and Magnetic Susceptibility and 5.2.4, Microbial Analysis, for the general public and stakeholders.

54. Section 7 Summary and Conclusions, page 7-3

Permittee Statement: "In general, soil moisture was less than 5% in vadose zone samples (Table 5-7)."

NMED Comment: Report revision required. According to Table 5-7, soil moisture in vadose zone samples were greater than 10% in many samples, and greater than 15% in approximately one dozen samples, while soil moisture was significantly lower, on average, in the saturated zone. The Permittee must revise the Report to correct this statement and explain why soil moisture levels are higher in the vadose zone relative to the saturated zone, particularly in the area where SVE systems have been operated (KAFB-106V1 and KAFB-106V2).

55. Section 7 Summary and Conclusions, page 7-3

Permittee Statement: "The clays do not appear to have significantly affected lateral migration of the LNAPL. LNAPL migration was primarily by gravity drainage rather than horizontal migration along low permeability (i.e., clay or silt) zones."

NMED Comment: Report revision required. The conclusion that clays do not appear to have significantly affected lateral migration of the LNAPL minimizes the importance of the impact of the clays at the site. The vapor and LNAPL plumes depicted in Figures 5-8 through 5-14 indicate that the clay layer identified at approximately 265 ft bgs caused lateral migration of the contaminant plume. The statement must be revised for clarity.

56. Section 7 Summary and Conclusions, page 7-3

Permittee Statement: "Average gravel LNAPL saturations were 2.57 and 0.9% relative to pore volume and total volume, respectively. For the medium sand samples from the saturated zone, LNAPL saturation ranged from 0.04 to 4.9% pore volume and from 0.02 to 2.0% total volume, respectively. The coarse sand sample from the saturated zone had a LNAPL saturation of 0.08% pore volume and 0.03% total volume. Average LNAPL saturation relative to pore volume and total volume for the three fine sand samples averaged 2.4 and 1.0%, respectively".

NMED Comment: Report revision required. The statement must be revised for accuracy once the issues identified by NMED related to the classification of soil types have been resolved.

57. Section 8 References, page 8-1

NMED Comment: Monitoring well completion reports are listed as individual references but were not submitted to NMED as individual documents. The reports were submitted as appendices in other documents and the title and cover pages of those documents did not identify the presence of the monitoring well completion reports. The Permittee must revise the Report to cite the document, section, and page numbers in which each of the monitoring well completion reports is presented. Additionally, the Permittee must revise the Report to include all of the well completion reports for the well installations associated with this scope of work as an appendix.

58. Section 8 References, page 8-1

NMED Comment: Report revision required. The document "NMED. 2019b. *Approval to Not Install KAFB-106S6 and Relocate KAFB-106247* by Mr. Dennis McQuillan, Chief Scientist. January 25." is not included in Appendix A, Regulatory Correspondence. Please revise the Report to include the reference in Appendix A.

59. Figures 5-1 Cross Section A-A' and 5-2, Cross Section B-B'

NMED Comment: Report revision required.

a. Figures 5-1 and 5-2 are not true cross sections or fence diagrams. They appear to be an interpolation of subsurface geology across the site. Some of the wells used to create the figures are offset too far from the transects to accurately depict subsurface geology. Please revise Figure 5-1 and 5-2 with more reasonable cross section lines. The Permittee must also depict the actual elevation/depth to water on the figure.

b. The cross-sections presented in Figures 5-1 and 5-2 are inadequate in depicting the subsurface conditions across the site, particularly in the source area, because they are inconsistent with much of the lithologic data previously obtained at the site. Revise the Report to include cross sections that appropriately incorporate existing lithologic and geophysical data from other nearby wells in the area and include depth to water and historic high and low water levels. The cross sections must also depict key stratigraphic surfaces such as the top of the ancestral Rio Grande sediments and the top and bottom of the fine grained, low permeability intervals that occur between 250-300 feet bgs. Multiple straight line transects must be presented rather than a single transect with multiple directional changes. The cross sections must be presented in a large enough format to allow the details to be discernable. This issue was discussed during the NMED/KAFB conference call on June 18, 2020.

60. Figures 5-3 BTEX Concentrations In Soil, 5-4, EDB Concentrations In Soil, and 5-5, TPH Concentrations In Soil

NMED Comment: Report revision required. Soil screening levels are not included on Figures 5-3, 5-4, and 5-5. Please revise these figures to include the soil screening levels used for each contaminant of concern and reference which screening levels were used (e.g., NMED, EPA, etc.) in the "Notes" section of the figures.

61. Figure 5-5 TPH Concentrations in Soil

NMED Comment: Report revision required. There is no unit of measurement for the TPH data in the figure. Please revise Figure 5-5 to indicate a unit of measurement for TPH concentration data.

62. Figure 5-6 Benzene Concentrations in Groundwater Reference Elevation Interval 4857, Q2 2019

NMED Comment: Report revision required. The "Notes" section of Figure 5-6 refers to two abbreviations, MVS and REI, that are not defined in the Report. Please revise the Report to define the abbreviations. Additionally, the title of the figure refers to Reference Elevation Interval 4857. This term is not defined in the Report. Revise the Report to provide an explanation of the term and the significance of the associated value. Add a figure similar to Figure 3-2, Reference Elevation Capture and Containment Intervals, of the Q2 2019 Quarterly Report to provide a point of reference for understanding the concept of reference elevations.

63. Figure 5-6 Benzene Concentrations in Groundwater Reference Elevation Interval 4857, Q2 2019

NMED Comment: Report revision required. A large portion of the figure depicts wells north of Ridgecrest Drive which were not sampled for benzene. Please provide an explanation in the relevant section of the revised Report as to why these wells were not sampled for benzene. In addition, provide the date when benzene was last detected north of Ridgecrest Drive, the wells in which it was last detected, and which wells currently provide evidence of lateral containment of the benzene plume. These wells must be easily identifiable in the revised Report.

64. Figure 5-7 LNAPL-Filled Porosity from Continuous Coring

NMED Comments: Report revision required. The legend indicates that the ≥5 µg/L isocontour for benzene is shown rather than the effective solubility concentration for benzene of 1.43 mg/L. The Permittee must depict the effective solubility concentration for benzene of 1.43 mg/L on Figure 5-7. Furthermore, the legend indicates that the green shaded area of the figure depicts the estimated extent of LNAPL/Residual LNAPL in groundwater while the title block of the figure indicates that the figure presents LNAPL filled porosity from continuous coring. Revise the Figure 5-7 to resolve the discrepancy. Finally, while Figure 5-7 shows wells that contain free phase LNAPL on groundwater, it is difficult to compare this with the submerged LNAPL in soil porosity that is also presented in the figure. Please revise Figure 5-7 to include contours for confirmed free phase LNAPL.

65. **Figure 5-8 EVS Model 3-Dimensional Views South to North and East to West**
Figure 5-9 EVS Model 3-Dimensionalview Showing Clays at 265 Feet Depth
Figure 5-10 EVS Model of Historical Groundwater Elevations Relative to the Vadose Zone Plume and the Dissolved Benzene Plume in Groundwater
Figure 5-11 3-Dimensional View Showing Estimated Location of LNAPL in the Saturated Zone

NMED Comment: Report revision required. NMED has identified the following issues with Figures 5-8 through 5-11:

a. Revise all figures to include a North arrow.

b. Revise the figures to include well identification numbers and pertinent site features (e.g.: source area, former loading racks, former and current above ground storage tanks, any visible KAFB boundaries, Ridgecrest Drive).

c. The plume depiction does not appear to match the data because there are several red and yellow soil vapor monitoring well (SVMW) points with elevated contaminant concentrations that are not incorporated into the plume. Explain this discrepancy and identify anomalous data on the figures in the revised Report.

d. Revise the Report to enable the reader to cross reference the lithologic data points for the intricate edges of the clay lenses with the other data presented in the report.

**66. Figure 5-8 EVS Model 3-Dimensional Views South to North and East to West
Figure 5-10 EVS Model of Historical Groundwater Elevations Relative to the Vadose Zone Plume and the Dissolved Benzene Plume in Groundwater**

NMED Comment: Report revision required. It is difficult to interpret what represents BTEX in soil vapor and what represents dissolved benzene in groundwater because the same color scale is used for both data sets. Please revise Figures 5-8 and 5-10 to utilize contrasting color scales for BTEX concentrations in soil vapor and dissolved benzene concentrations in groundwater.

67. Figure 5-10 EVS Model of Historical Groundwater Elevations Relative to the Vadose Zone Plume and the Dissolved Benzene Plume in Groundwater

NMED Comment: Report revision required. The figure is difficult to interpret because it is unclear if LNAPL thickness is represented and it is difficult to determine the compass orientation. Revise the figure to include well identification numbers and a north arrow for the purpose of orienting the features depicted in the figure. Also, the figure should be representative of the statements made in Section 5-3.

**68. Figure 5-9 EVS Model 3-Dimensionalview Showing Clays at 265 Feet Depth
Figure 5-10 EVS Model of Historical Groundwater Elevations Relative to the Vadose Zone Plume and the Dissolved Benzene Plume in Groundwater
Figure 5-11 3-Dimensional View Showing Estimated Location Of LNAPL in the Saturated Zone**

NMED Comment: Report revision required. The explanation of "Depth" in the legends is inaccurate. For example, on Figure 5-9, the legend states "(250) = Depth 100 feet below ground surface". Please revise the figures to accurately indicate depth.

**69. Figure 5-8 EVS Model 3-Dimensional Views South to North and East to West
Figure 5-11 3-Dimensional View Showing Estimated Location of LNAPL in the Saturated Zone**

NMED Comment: Report revision required. Both figures appear to be missing key soil vapor data from Q2 2019. For example, Q2 2019 soil vapor data from soil vapor monitoring point SVMW-09-266 shows a BTEX concentration of 3,398,000 parts per billion (ppb), which is not included in the figure. Please revise the figures to clearly depict all relevant Q2 2019 soil vapor data. Also, ensure that all monitoring points are labeled on all figures.

70. Figure 5-11 3-Dimensional View Showing Estimated Location of LNAPL in the Saturated Zone

NMED Comment: Report revision required. Figure 5-11 is very difficult to read and interpret. There is no information on the figure which allows the reader to place the information presented within a spatial context for the BFFS:

a. The figure depicts multiple isolated LNAPL bodies below the water table without explanation. Please revise the Report to include a discussion of the significance of the isolated LNAPL bodies depicted on Figure 5-11 and clarify whether all of the LNAPL bodies are included in the estimation of the LNAPL smear zone thickness.

b. It is difficult to correlate high levels of BTEX in soil vapor (<10,000 μg/m^3) in the representation of the subsurface of site. Add well identification numbers to the figure.

c. The legend indicates that "LNAPL in Groundwater" is depicted in the figure as a concentration ranging from 1,000 to 19,068 mg/kg. LNAPL is not usually presented as a concentration. Additionally, it is difficult to identify LNAPL in the figure. Please explain the presentation of LNAPL in units of mg/kg and revise Figure 5-11 so that LNAPL is readily identified.

d. Indicate which quarterly measurements (e.g., Q2 2019) were used to generate the depiction of LNAPL shown in the figure.

e. The area of interest on this figure is the submerged LNAPL in the saturated zone; however, the part of the figure in which the submerged LNAPL is illustrated is only a small portion of the total area available in the figure. Revise the Report to provide an additional figure focusing on the area of submerged LNAPL in the saturated zone which includes a way to identify the location beneath the BFFS site, appropriate scale indicators, and well identification numbers.

71. Figure 5-12 Dissolved Benzene in the Saturated Zone

NMED Comment: Report revision required. NMED has identified multiple issues with this figure:

a. It is difficult to interpret concentration data without clear contaminant contour lines. Please revise the figure to include contour lines.

b. It is unclear what data were used to create this plume image. If the data for all groundwater monitoring wells sampled during Q2 2019 were included, these wells must be identified in the figure. If not, the Permittee must justify that the limited data set is representative of the site conditions. The Permittee must clarify and provide an explanation in the appropriate section of the revised Report.

c. The legend shows a color scale for dissolved benzene in groundwater but the notes reference Q2 2019 soil vapor data. Please resolve the discrepancy.

72. Figure 5-13 Total BTEX in Soil Vapor in the Vadose Zone

NMED Comment: Report revision required. NMED has identified the following issues with the figure:

a. The area of interest is very small compared to size of the background aerial photograph, and therefore approximately 80% of figure is non-relevant imagery of the surrounding area. Please revise the figure scale to clearly depict area of interest.

b. It is unclear what data was used to create the figure. Revise the figure to identify the wells from which data was used to create the figure.

c. It is unclear what subsurface sampling elevations were used to create the depiction of the soil vapor plume. Revise the figure to indicate the subsurface elevations represented on the figure.

d. The color gradient scale in the legend is very subtle in its differentiation between values over several orders of magnitude; furthermore, the colors in the legend do not match the colors in the figure. Revise the figure using a more detailed color gradient that matches the colors used in the figure and add contaminant contour lines.

e. The figure depicts an isolated pocket of elevated BTEX vapor to the west of KAFB-106S3 with no associated soil vapor wells or data points in the vicinity to identify the source of the data used to create the figure. Also, it is difficult to estimate the concentration of this pocket of BTEX soil vapor using the scale provided in the legend of the figure. The Permittee must discuss this pocket of BTEX in the relevant portions of the Report and add associated data points to the revised Figure.

73. Figure 5-14 Total BTEX in Soil Vapor in the Vadose Zone, and Dissolved Benzene in the Saturated Zone

NMED Comment: Report revision required. NMED has identified multiple issues with the figure:

a. It is not clear to which depth/elevations the depicted soil vapor data correspond. Please revise the figure to add depths/elevations.

b. The figure portrays groundwater data and soil vapor data with the same color scheme making it difficult to precisely interpret the data presented on the figure. Revise the figure with different color schemes for each data set depicted on the figure.

c. The color gradient panel for BTEX in soil vapor does not match the color presented on the figure. Revise the figure to use a color scale that matches both the key and the data.

d. It is unclear which data were used to create Figure 5-14. Wells KAFB-106V1 and KAFB-106V2 are not included on Figure 5-14. Revise the figure notes to explain which data sets were used to create Figure 5-14 and include all data points in the revised figure.

e. A large portion of Figure 5-14 depicts non-relevant surrounding satellite imagery. Revise the scale of the figure to provide greater detail for the area of interest.

74. Table 3-1 Coring Intervals and Soil Sample Locations

NMED Comment: Report revision required. Many different types of soil samples were collected for this field effort. Revise Table 3-1 to include any samples that may have been collected with drilling methods other than sonic (e.g., air rotary casing hammer). Additionally, please revise Table 3-1 to indicate which types of samples were collected at the depths presented on the revised table.

75. Table 4-1 Photoionization Detector Field Screening Data

NMED Comment: Report revision required. The depth for KAFB-106S8 is incorrectly expressed as a PID reading of 70.4 ppm rather than a depth of 450 ft bgs. Please revise the table to correct the error.

76. Table 4-1 Photoionization Detector Field Screening Data

NMED Comment: Report revision required. Table 3-3 of the Work Plan, along with Table 3-1 and Table 4-1 of the Report indicate that KAFB-106247, the 'background' boring, was only sampled at 5 of the 10 proposed sample intervals defined by the Work Plan. In Section 4.3 (Deviations from Work Plan) of the revised Report, please explain why laboratory samples for KAFB-106247 were not collected according to the approved Work Plan.

77. Table 5-1 Analytical Results for Total Petroleum Hydrocarbons and Volatile Organic Compounds in Soil

NMED Comment: Report revision required. All laboratory results are presented in Table 5-1 with the LOD only. Add a column to Table 5-1 to report the DL, LOD, and LOQ for each analysis presented. See General Comment 4.g.

78. Table 5-1 Analytical Results for Total Petroleum Hydrocarbons and Volatile Organic Compounds in Soil

NMED Comment: The table footnotes refer to "RSL = regional screening level". The regional screening levels (RSLs) are not included in Table 5-1. Revise Table 5-1 to include a column for the appropriate screening levels used for the Report and reference the screening levels correctly in the table footnotes (e.g., NMED, NMWQCC, EPA, etc).

79. Table 5-2, Soil Grain Size Distribution and Classification

NMED Comment: Report revision required. The USCS Classification appears to be based on the lithologic logs rather than the particle size distribution presented in the table. See Comment 25. The Permittee must also include a table which compares the lithologic log descriptions to the laboratory particle size distribution in the revised Report.

80. Table 5-3 Lithology and Interstitial Properties of Selected Core Samples

NMED Comment: Report revision required. Table 5-3 presents data quantifying porosity, permeability, and saturation of cores based on lithology and analyses of individual cores. In the relevant section of the Report, the Permittee must discuss fluid losses that may have occurred to cores during retrieval of the cores from boreholes during the drilling process and how this may affect sample integrity, data representativeness, and the representativeness of estimates of soil moisture in the vadose and saturated zones.

81. Table 5-4 Summary of LNAPL Saturation and Mobility for Select Core Samples

NMED Comment: Report revision required. Please revise the table to add a footnote explaining how LNAPL Saturation (%TV) was calculated for this table.

82. Table 5-7 Summary of Soil Analytical Moisture Content

NMED Comment: Report revision required. Table 5-7 contains inconsistencies, errors, and omissions. The Permittee must correct the following in the revised report:

a. Add a footnote to indicate what impact fluid loss, due to core retrieval and sample shipping and handling, may have had on soil moisture content in samples.

b. The manner in which the LNAPL data is presented is unclear. For example, the result of 7.2% LNAPL at 122 ft bgs could belong to either V1 or V2, or both, and the result of 2.1% LNAPL at 490 ft bgs could belong to either S5 or S9. Provide clarification on which borings and sample depths correspond to the percentages of LNAPL.

c. The manner in which the lithologic data is presented is misleading. It is not accurate to assume that lithologies remain consistent at any given depth across the area of investigation. Some cells in the "USCS" column of the table have more than one lithology listed, some are separated by dashes, slashes, and or/spaces and some are presented in different colored fonts. For example, at the depth of 360 ft bgs there are two readings for soil moisture (for S3 and S5), and the USCS is presented as "SW-SP/SM" on the left side of the cell and "SW" on the right side of the cell. It is unclear which lithology is associated with S3 and which is associated with S5. Furthermore, the color coding of the font to represent different laboratories that performed analyses does not always correlate with the order of presentation of the data at any given depth. Revise Table 5-7 to accurately present soil moisture data and lithology at the site.

d. The Permittee must add the DBS lab results for KAFB-106247 at 490 ft bgs.

e. The Permittee must add the PTS laboratory results for KAFB-106S5 at 488 ft bgs and KAFB-106S7 at 492 ft bgs.

f. The result for S9 at 342 ft bgs is presented as 14%, whereas the TA laboratory results present the value as 16.3%. Correct this discrepancy in the revised Report.

g. Adjust the font color for results for V1 at 158 ft bgs to blue to indicate that the analysis was performed by PTS laboratory.

h. Data in the Table is presented with inconsistent significant figures. The Permittee must use consistent significant figures in all data presented in the revised report.

83. Table 5-8, Table 5-8

NMED Comment: The results for percent moisture for five of the 22 samples presented do not match the results for percent moisture presented on Table 5-7. Please correct these discrepancies in the revised Report.

84. APPENDIX C - TEMPERATURE LOGS

NMED Comment: The Core Temperature Log indicates many instances where intervals of core were dropped from the core barrel into the borehole during the process of bringing the core to the surface. In some cases, the partial sections of disturbed core were retrieved by the driller. The driller also reports the addition of water to the borehole during drilling. The driller's comments must be addressed in Section 4.3, Deviations from Work Plan. The impact on sample integrity of dropped and/or lost core, and data representativeness must be addressed in the appropriate sections and tables of the Report. Revise the Report accordingly.

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

16 July 2020

Colonel Ryan Nye, USAF
Vice Commander
377th Air Base Wing
2000 Wyoming Blvd SE
Kirtland AFB NM 87117

Mr. Kevin Pierard, Chief
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building 1
Santa Fe NM 87505-6303

Dear Mr. Pierard

The Air Force has recently received several letters as detailed below from the New Mexico Environment Department's (NMED's) Hazardous Waste Bureau (HWB) in which more global comments and regulatory directives not specifically relating to the document under review have been provided. As discussed in our 23 June 2020 conference call, these types of comments and directives create confusion in the administrative record for the Kirtland Air Force Base Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111 project. These global directions are essentially "hidden" from the public because the subject line of the document does not indicate the future direction, making it difficult to find and retrieve from the administrative record. In addition, because the HWB does not maintain a comprehensive record of these directives, HWB staff may subsequently issue inconsistent or contradictory direction to the Air Force. This practice also has the potential for inadvertent noncompliance by the Air Force.

The Air Force respectfully requests that the HWB issue separate letters of direction for each of the recent global directions identified in Attachment 1, Memorandum from Kevin M. Pierard to Col David S. Miller and Lt Col Wayne J. Acosta with the subject line: *Disapproval, Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, Solid Waste Management Units ST- 106/SS-111, Kirtland Air Force Base, New Mexico, EPA ID# NM9570024423, HWB-KAFB-19-014*, dated 26 May 2020, and in all future communications. The Air Force also requests a meeting with HWB staff to discuss questions regarding the global directions listed in Attachment 2, Memorandum from Kevin M. Pierard to Col David S. Miller and Lt Col Wayne J. Acosta with the subject line: *Disapproval, Ethylene Dibromide In Situ Biodegradation Pilot Test Report, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, New Mexico, EPA ID# 6213820974, HWB-KAFB-19-011*, dated 04 March 2020.

If you have any questions or would like to schedule a meeting to discuss the global directions listed in Attachment 2, please contact Mr. Sheen Kottkamp at 505-846-7674 or sheen.kottkamp.1@us.af.mil.

Sincerely

RYAN NYE, Colonel, USAF
Vice Commander

Attachment 1:
Table 1: Global Comments from NMED having Air Force Agreement

Attachment 2:
Table 2: Global Comments from NMED Requiring Further Discussion

cc:
NMED HWB (Pierard), electronic and hardcopy
NMED Resource Protection Division (Stringer), electronic only
NMED HWB (Cobrain), electronic only
NMED OGC (Hower), electronic only
SAF/IEE (Lynnes), electronic only
377 ABW/JA (Ciccarelli), electronic only
AFCEC/CZ (Cash, Kottkamp, Segura), electronic only
USACE-ABQ District Office (Moayyad), electronic only
Public Info Repository, Administrative Record/Information Repository (AR/IR) and File

ATTACHMENT 1
Global Comments from NMED having Air Force Agreement

NMED Comment	Reference Location	Comments
"The Permittee must include their Response to Comments (RTCs) in a document appendix for all revised documents submittals. While the Permittee submitted the RTCs in a separate electronic file, the RTCs must be included as an appendix to the plan to allow stakeholders and the public easy access when reviewing the document. For all future revised documents submitted to NMED, the Permittee must include the RTCs as an appendix to the document. Please revise the Work Plan accordingly. This was discussed on May 7; KAFB agreed to follow this procedure."	Comment 1 in Attachment 1 – NMED Comments of 26 May 2020 Letter*	Air Force agrees with this direction
"Comment #1 of NMED's July 26, 2019 Rejection letter states, "...the pages of the attachments contain no page numbers...In order for NMED to be able provide comments that reference where issues are found, as well as for the public to be able to review the document in the Administrative Record, every page of every document submitted must be numbered appropriately. The Permittee must submit a work plan in the appropriate format, including addition of the appropriate information in the corresponding sections, based on the Permit requirements and must sequentially number every page in the document." The Permittee failed to sequentially number all pages of the document as directed by NMED in the Tables section, the Figures Section, and all three appendices of the Work Plan. In addition, the appendices contain tables with no table numbers, figures with no figure numbers, and multiple pages with no page numbers at all. The Permittee must ensure that all submittals, including the revised Work Plan, include sequential page numbers on all pages, and that tables, figures, and appendices are properly numbered. Making this correction will facilitate timely review and precise communication between NMED and KAFB on all documents submitted for review. It will also facilitate references to information and subsequent activities (e.g., review of corrective action documents). Please revise the Work Plan accordingly. This was discussed on May 7; KAFB agreed to follow this procedure."	Comment 2 in Attachment 1 – NMED Comments of 26 May 2020 Letter*	Air Force agrees with this direction
"The Permittee has used multiple designations for wells in the Work Plan. For instance, Section 3.1 of the Work Plan discusses wells KAFB-SV-01, KAFB-SV-02, KAFB-SV-03, etc., while Table 1 of the Work Plan lists these wells as KAFB-106-SV01, KAFB-106-SV02, KAFB-106-SV03, etc. and Figure 2 of the Work Plan lists the wells as KAFB-106SV01, KAFB-106SV02, KAFB-106SV03, etc. Use of multiple designations inhibits NMED's ability to timely review documents by limiting the search function and causing confusion when searching for data in spreadsheets or databases. This issue is evident in many documents submitted by the Permittee. The Permittee must use the official full designation for each well consistently in the revised Work Plan and in all future documents submitted to NMED. This was discussed on May 7; KAFB agreed to follow this procedure."	Comment 3 in Attachment 1 – NMED Comments of 26 May 2020 Letter*	Air Force agrees with this direction

NMED Comment	Reference Location	Comments
"Based on prior issues with missing information in submittals, NMED is clarifying what it requires for this and all future submittals. In addition to the information listed above, the permittee is required to include the following: • The response to NMED's comments must be included as Appendix A of each document revision. • Descriptions of all field activities performed for the project must be provided. References to QAPPs, SOPs, or work plans are not acceptable. All deviations from the approved work plan must be discussed and justified in a Deviations section. • Wells must be consistently referred to by the same name/designation and all sections of the text, all tables, and all figures. The designation must match that provided in the digital analytical data files, as well. • Sampling data tables must include the LOQ (PQL) and reporting detection limit for each analysis. • Sampling data tables must include the appropriate screening levels for data comparison. • Analytical data tables in digital format must include a column that indicates which analytical data report the specific sample information can be found. This link must correspond to the analytical data report file name. • Data from analyses where the LOQ exceeds the VISL are data quality exceptions and must be identified as such an all tables and figures. • Analytical data provided in digital format such as Excel or Access files must be provided in a sortable, searchable format. In other words, previous reports have provided digital data in the same format as the tables in the text. These tables are not sortable or searchable. Provide the tables in a standard database format. • Analytical data packages must be submitted in accordance with Permit Section 6.5.18.2, Laboratory Deliverables. • All tables, figures, and appendices must be appropriately numbered and titled. • Every page of every submittal, including all pages within all sections and appendices, must be numbered either sequentially or in some other logical format. This was discussed on May 7; KAFB agreed to follow this procedure."	Comment 11 in Attachment 1 – NMED Comments of 26 May 2020 Letter*	Air Force agrees with this direction

*Memorandum from Kevin M. Pierard to Col David S. Miller and Lt Col Wayne J. Acosta with the subject line: *Disapproval, Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, New Mexico, EPA ID# NM9570024423, HWB-KAFB-19-014*. 26 May 2020.

ATTACHMENT 2
Global Comments from NMED Requiring Further Discussion

NMED Comment	Reference Location	Comments
"The collection of soil samples for laboratory analyses is necessary for every boring in the source area. The soil sampling data will provide useful information to determine the extent of soil contamination. The described field screening method does not provide sufficient data for site characterization. Propose to collect soil samples from every boring at the site in all future work plans."	Comment 9 in Attachment to 04 March 2020 Letter*	Air Force requests a meeting with NMED to discuss this global direction
"A primary focus for the remedy at the site is an abatement of LNAPL. Once LNAPL is abated, the concentrations of the dissolved constituents are likely to gradually decrease. Therefore, the screened intervals of the extraction wells should not have been designed to be submerged below the water table. In the future, the screened intervals of all shallow groundwater monitoring and recovery wells must intersect the water table to capture LNAPL unless otherwise pre-approved by NMED."	Comment 27 in Attachment to 04 March 2020 Letter*	Air Force requests a meeting with NMED to discuss this global direction

*Memorandum from Kevin M. Pierard to Col David S. Miller and Lt Col Wayne J. Acosta with the subject line: *Disapproval, Ethylene Dibromide In Situ Biodegradation Pilot Test Report, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, New Mexico, EPA ID# 6213820974, HWB-KAFB-19-011*. 04 March 2020.

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 2, 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil engineer Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: REPORTING REQUIREMENTS FOR ALL DOCUMENT SUBMITTALS
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-20-MISC

Dear Colonel Miller and Lt. Colonel Acosta:

In our discussions with Kirtland Air Force Base (KAFB or Permittee) staff, a concern was raised that New Mexico Environment Department (NMED) comments on specific submittals contained direction that more broadly applies to various activities conducted at KAFB. Your staff indicated that this creates difficulty for them in tracking directions provided by NMED. To respond to such concerns, NMED is providing the following compilation to clarify requirements for all documents submitted to NMED by the Permittee.

In general, many KAFB submittals to NMED consistently contain a substantial number of errors that should be identified during quality assurance and quality control reviews prior to submittal. In discussions with KAFB staff, NMED staff was assured that steps are being taken to review and enhance document quality control and address these recurring issues to assist NMED in expediting document reviews and to assist the public in better understanding the documents that are submitted by the Permittee.

Col. Miller and Lt. Col. Acosta
Reporting Requirements
Page 2

1. **Laboratory Deliverables:** Section 6.5.18.2, Laboratory Deliverables, of the KAFB Resource Conservation and Recovery Act (RCRA) Permit (KAFB Permit), states the requirements for analytical laboratory reporting. The section states, "[l]aboratory analytical data packages shall be prepared in accordance with EPA-established Level III or IV analytical support protocols." The final paragraph of the permit section goes on to state, "[t]he Permittee shall present summary tables of these data and Level II QC results to the Department in reports or other documents prepared in accordance with Permit Section 6.2.4. Raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory supporting data for samples from this project, shall be compiled and kept on file at the Facility for reference. The Permittee shall make all data available to the Department upon request." Therefore, for purposes of reporting, Level II QC results are necessary. Level III and IV data must be maintained by the Permittee to be made available upon request.

2. **General Guidelines:** NMED has included an attachment titled *General Reporting Guidelines* that provides guidance regarding its expectations of submittals to the Hazardous Waste Bureau. The Permittee must consult the guidance during document preparation.

3. **Document Scopes of Work:** In order to avoid confusion, all work plans must be written for one specific scope of work.

4. **Document Titles vs. Content:** All future document titles on cover pages must include all major scope activities incorporated within that document, including those presented in appendices. The names of all future documents and scopes of work must not change during the RCRA corrective action process (i.e., work plans through reports).

5. **Responses to NMED Comments:** Responses to NMED comments must be included as Appendix A of every document revision. Redline-strikeout versions must include <u>all</u> changes made to the corresponding revised document.

6. **Field Methods:** All field methods for the project must be documented in the text of the document or an appendix. The documentation must be specific to each monitoring activity, such as soil vapor monitoring, groundwater monitoring, or operation and maintenance of the groundwater treatment system. References to quality assurance project plans (QAPPs), standard operating procedures (SOPs), previous work plans, or other documents are not acceptable. All deviations from approved work plans must be discussed and explained in a Deviations section.

7. **Well Designations:** Wells must be consistently referred to by the same name/designation in all sections of the text, all tables, and all figures. The designation must also match that provided in the digital analytical data files.

8. **Data Tables, Figures, and Appendices:**
   - **a.** Sampling data tables must be logically arranged, either chronologically or by investigation, to facilitate location of information.
   - **b.** Sampling data tables must include the practical quantitation limit (PQL) and reporting detection limit for each analysis. Method detection limits must also be provided for each analytical method.
   - **c.** Sampling data tables must include the appropriate screening levels for data comparison.
   - **d.** Analytical data tables in digital format must include a column that indicates which analytical data report the specific sample information can be found. This link must correspond to the analytical data report file name.
   - **e.** Data from analyses where the PQL (or LOQ) exceeds 20% of the screening level are data quality exceptions and must be identified as such in all tables and figures.
   - **f.** Analytical data provided in digital format such as Excel files must be provided in a sortable, searchable format that can be uploaded into a database. Previous reports have provided digital data in the same format as the tables in the text which are not sortable or searchable.
   - **g.** Data in tables and figures must be presented with a consistent and appropriate number of significant figures.
   - **h.** All points (wells), structures, infrastructure, roads, etc. depicted on figures must be labeled.
   - **i.** All tables, figures, and appendices must be appropriately numbered and titled.
   - **j.** All figures must include a scale and a north arrow.
   - **k.** Data tables and figures must undergo quality assurance and quality control review prior to submittal to NMED.

9. **Document organization:** Every page of each submittal, including all pages within all sections and appendices, must be numbered either sequentially or in some other logical format.

Many of the issues listed above were discussed during a conference call between NMED and KAFB that was held on May 7, 2020; KAFB staff stated that they understood these issues and agreed to correct these problems. While NMED made every attempt to be comprehensive, other issues may arise. If NMED identifies further issues that occur in multiple submittals, NMED will contact KAFB staff informally to discuss the issues and follow up with further correspondence and direction.

Should you have any questions or wish to meet with us to discuss these comments, please contact me at (505) 476-6035 or your staff may contact Ben Wear at (505) 476-6041.

Sincerely,

Kevin Pierard

Digitally signed by Kevin Pierard
Date: 2020.09.02 11:45:56 -06'00'

Kevin M. Pierard, Chief
Hazardous Waste Bureau

Attachment

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
L. Andress, NMED HWB
M. Suzuki, NMED HWB
R. Murphy, NMED HWB
L. King EPA Region 6 (6LCRRC)
C. Cash, KAFB
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

Attachment

GENERAL REPORTING GUIDELINES

1. Overview

The purpose of this guidance document is to provide the general requirements and formats for documents related to corrective action activities required under the Resource Conservation and Recovery Act (RCRA). This guidance is not intended to provide document requirements for every potential corrective action conducted at the facility. Therefore, the formats for all types of documents are not presented below. The formats described include the general reporting requirements and formats for site-specific investigation work plans, investigation reports, routine monitoring reports, risk assessment reports, and corrective measures evaluations. Permittees should generally consider the documents to be the equivalents of RCRA facility investigation (RFI) work plans, RFI reports, periodic monitoring reports, risk assessments, and corrective measures study (CMS) reports, respectively, for the purposes of RCRA compliance. Permittees must include detailed, site-specific requirements in all interim status unit, solid waste management unit (SWMU), and Area of Concern (AOC) investigation work plans, investigation reports, monitoring reports, and corrective measures evaluations. All plans and reports should be prepared with technical and regulatory input from the NMED. All work plans and reports must be submitted to the NMED in the form of two paper copies and an electronic copy.

The document requirements listed do not include all sections that may be necessary to complete each type of document listed. A permittee or the NMED may determine that additional sections are required to address additional site-specific issues or information collected during corrective action or monitoring activities not listed below. However, permittees must submit variations of the general report format and the formats for documents not listed in this guidance in outline form to the NMED for approval prior to submittal of the documents. The NMED will approve or disapprove, in writing, the proposed document outline after receipt of the outline. If the NMED disapproves the report outline, the NMED will notify the permittee, in writing, of the outline’s deficiencies and will specify a date for submittal of a revised report outline. All documents submitted by the Permittee must follow the general approach and limitations for data presentation described in this guidance document. If in conflict with a facilities RCRA Permit, the Permit condition should be followed.

2. Investigation Work Plan

Permittees must fulfill the requirements for preparation of work plans for unit-specific or corrective action activities at the facility using the general outline below. The minimum requirements for describing proposed activities within each section are included. All research, locations, depths and methods of exploration, field procedures, analytical analyses, data collection methods, and schedules must be included in each work plan. In general, interpretation of data acquired during previous investigations must be presented only in the background sections of the work plans. The other text sections of the work plans must be reserved for presentation of anticipated site-specific activities and procedures relevant to the project. The general work plan outline is provided below.

2.1 Title Page

The title page must include the type of document, facility name and the unit, SWMU, or AOC name(s) and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible representative of the facility must be provided on the title page in accordance with the signature requirements in 40 CFR 270.11(b).

2.2 Executive Summary (Abstract)

The executive summary (or abstract) must provide a brief summary of the purpose and scope of the investigation to be conducted at the subject site. The facility, unit, SWMU, or AOC name, revision number if applicable, and location must be included in the executive summary.

2.3 Table of Contents

The table of contents must list all text sections and subsections, tables, figures, and appendices or attachments included in the work plan. The corresponding page numbers for the titles of each section of the work plan must be included in the table of contents.

2.4 Introduction

The introduction must include the facility name, unit name and location, and unit status (e.g., active operations, closed, corrective action). General information on the current site usage and status must be included in this section. A brief description of the purpose of the investigation and the type of site investigation to be conducted must be provided in this section.

2.5 Background

The background section must describe relevant background information. This section must briefly summarize historical site uses including the locations of current and former site structures and features. A labeled figure must be included in the document showing the locations of current and former site structures and features. The locations of pertinent subsurface features such as pipelines, underground tanks, utility lines, and other subsurface structures must be included in the background summary and labeled on the site plan.

This section must identify potential receptors, including groundwater, and include a brief summary of the type and characteristics of all waste and all contaminants, the known and possible sources of contamination, the history of releases or discharges of contamination, and the known extent of contamination. This section must include brief summaries of results of previous investigations, including references to pertinent figures, data summary tables, and text in previous reports. At a minimum, detections of contaminants encountered during previous investigations must be presented in table format, with an accompanying figure showing sample locations. References to previous reports must include page, table, and figure numbers for referenced information. Summary data tables and site plans showing relevant investigation locations must be included in the Tables and Figures sections of the document, respectively.

2.6 Site Conditions

2.6.1 Surface Conditions

A section on surface conditions must provide a detailed description of current site topography, features, and structures including a description of drainages, vegetation, erosional features, and a detailed description of current site uses and operations at the site. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff, or contaminant fate and transport must be included in this section.

2.6.2 Subsurface Conditions

A section on subsurface conditions must provide a brief, detailed description of the site conditions observed during previous subsurface investigations, including relevant soil horizons, stratigraphy, presence of vadose zone fluids and groundwater, and other relevant information. A site plan showing the locations of all borings and excavations advanced during previous investigations must be included in the Figures section of the work plan. A brief description of the anticipated stratigraphic units that may be encountered during the investigation may be included in this section, if no previous investigations have been conducted at the site.

2.7 Scope of Activities

A section on the scope of activities must briefly describe a list of all anticipated activities to be performed during the investigation, including background information research, health and safety requirements that may affect or limit the completion of tasks, drilling, test pit or other excavations, well construction, field data collection, survey data collection, chemical analytical testing, aquifer testing, and IDW storage, disposal, and reporting.

2.8 Investigation Methods

A section on investigation methods must provide a description of all anticipated locations and methods for conducting the activities to be performed during the investigation. This section must include, but is not limited to, research methods, health and safety practices that may affect the completion of tasks, drilling methods, test pit or other excavation methods, sampling intervals and methods, well construction methods, field data collection methods, geophysical and land survey methods, field screening methods, chemical analytical testing, materials testing, aquifer testing, pilot testing, and other proposed investigation and testing methods. This information may also be summarized in table format, if appropriate.

2.9 Monitoring and Sampling Program

A section on monitoring and sampling must describe the anticipated monitoring and sampling program to be implemented after the initial investigation activities are completed. This section must provide a description of the anticipated vadose zone fluids, groundwater, vadose zone vapor, vadose zone moisture, and other monitoring and sampling programs to be implemented at the unit.

2.10 Schedule

A section must provide the anticipated schedule for completion of field investigation, pilot testing, and monitoring/sampling activities. In addition, this section must provide a schedule for submittal of reports and data to the NMED, including a schedule for submitting status reports, preliminary data, and the final investigation report.

2.11 Tables

The following summary tables may be included in the investigation work plans if previous investigations have been conducted at the unit. Data presented in the tables must include information on dates of data collection, analytical methods, detection limits, and significant data quality exceptions. All data tables must include only detected analytes and data quality exceptions that could potentially mask detections. The following tables must be included in investigation work plans, as applicable;

a. summaries of regulatory criteria, background, and applicable cleanup levels (may be included in the analytical data tables instead of as separate tables);

b. summaries of historical field survey location data;

c. summaries of historical field screening and field parameter measurements of soil, rock, sediments, groundwater, surface water, and air quality;

d. summaries of historical soil, rock, or sediment laboratory analytical data must include the analytical methods, detection limits, and significant data quality exceptions that could influence interpretation of the data;

e. summaries of historical groundwater elevation and depth to groundwater data. The table must include the monitoring well depths, the screened intervals in each well, and the dates and times measurements were taken;

f. summaries of historical groundwater laboratory analytical data. The analytical data tables must include the analytical methods, detection limits, and significant data quality exceptions that could influence interpretation of the data;

g. summary of historical surface water laboratory analytical data. The analytical data tables must include the analytical methods, detection limits, and significant data quality exceptions that could influence interpretation of the data;

h. summary of historical air sample screening and chemical analytical data. The data tables must include the screening instruments used, laboratory analytical methods, detection limits, and significant data quality exceptions that could influence interpretation of the data; and

i. summary of historical pilot test or other test data, if applicable, including units of measurement and types of instruments used to obtain measurements.

2.12 Figures

The following figures must be included with each investigation work plan for each site, including presentation of data where previous investigations have been conducted. All figures must include an accurate bar scale and a north arrow. An explanation must be included on each figure for all abbreviations, symbols, acronyms, and qualifiers. The following figures must be included in investigation work plans, as applicable:

a. a vicinity map showing topography and the general location of the site relative to surrounding features and properties;

b. a unit site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and details; off-site well locations and other relevant features must be included on the site plan, if appropriate; additional site plans may be required to present the locations of relevant off-site well locations, structures, and features;

c. figures showing historical and proposed soil boring locations, excavation locations, and sampling locations;

d. figures presenting historical soil sample field screening and laboratory analytical data;

e. figures presenting the locations of all existing and proposed borings and vapor monitoring point locations,

f. figures presenting historical vadose zone organic vapor data;

g. figures showing all existing and proposed monitoring wells and piezometers;

h. figures presenting historical groundwater and vadose zone fluid elevation data, and indicating groundwater and vadose zone fluid flow directions;

i. figures presenting historical groundwater and vadose zone fluid laboratory analytical data, if applicable; the chemical analytical data corresponding to each sampling location can be presented in tabular form on the figure or as an isoconcentration map;

j. figures presenting historical and proposed vadose zone fluid neutron probe access tube locations and field measurement data for soil moisture, if applicable;

k. figures presenting historical surface water laboratory analytical data, if applicable;

l. figures showing historical and proposed air sampling locations and presenting historical air quality data, if applicable;

m. figures presenting historical pilot testing locations and data, where applicable, including site plans and graphic data presentation; and

n. figures presenting geologic cross-sections based on outcrop and borehole data acquired during previous investigations, if applicable.

2.13 Appendices

An IDW management plan must be included as an appendix to the investigation work plan. Additional appendices may be necessary to present additional data or documentation not listed above.

3. Investigation Report

Permittees must prepare investigation reports at the facility using the general outline below. Investigation Reports are the reporting mechanism for presenting the results of completed Investigation Work Plans. This section describes the minimum requirements for reporting on site investigations. All data collected during each site investigation event in the reporting period must be included in the reports. In general, interpretation of data must be presented only in the background, conclusions, and recommendations sections of the reports. The other text sections of the reports must be reserved for presentation of facts and data without interpretation or qualifications. The general report outline is provided below.

3.1 Title Page

The title page must include the type of document and version number, the facility name, the unit, SWMU, or AOC, and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible facility representative must be provided on the title page in accordance with the signature requirements in 40 CFR 270.11(b).

3.2 Executive Summary

The executive summary must provide a brief summary of the purpose, scope, and results of the investigation conducted at the subject site during the reporting period. In addition, this section must include a brief summary of conclusions based on the investigation data collected and recommendations for future investigation, monitoring, remedial action, or site closure.

3.3 Table of Contents

The table of contents must list all text sections, subsections, tables, figures, and appendices or attachments included in the report. The corresponding page numbers for the titles of each section of the report must be included in the table of contents.

3.4 Introduction

The introduction section must include the facility name, unit name and location, and unit status (e.g., active operations, closed, corrective action). General information on the site usage and status must be included in this section. A brief description of the purpose of the investigation, the type of site investigation conducted, and the type of results presented in the report also must be provided in this section.

3.5 Background

The background section must describe relevant background information. This section must briefly summarize historical site uses including the locations of current and former site structures and features. A labeled figure must be included in the document showing the locations of current and former site structures and features. The locations of subsurface features such as pipelines, underground tanks, utility lines, and other subsurface structures must be included in the background summary and labeled on the figure. In addition, this section must include a brief summary of the possible sources of contamination, the history of releases or discharges of contamination, the known extent of contamination, and the results of previous investigations including references to previous reports. The references to previous reports must include page, table, and figure numbers for referenced information. A site plan showing relevant investigation locations and summary data tables must be included in the Figures and Tables sections of the document, respectively.

3.6 Scope of Activities

This section on the scope of activities must briefly describe all activities performed during the investigation event including background information research, implemented health and safety measures that affected or limited the completion of tasks, drilling, test pit or other excavation methods, well construction methods, field data collection, survey data collection, chemical analytical testing, aquifer testing, remediation system pilot testing, and IDW storage or disposal.

3.7 Field Investigation Results

A section must provide a summary of the procedures used and the results of all field investigation activities conducted at the site including, but not limited to, the dates that investigation activities were conducted, the type and purpose of field investigation activities performed, field screening measurements, logging and sampling results, pilot test results, construction details, and conditions observed. Field observations or conditions that altered the planned work or may have influenced the results of sampling, testing, and logging must be reported in this section. At a minimum, the following subsections must be included, where appropriate.

3.7.1 Surface Conditions

A section on surface conditions must describe current site topography, features, and structures including topographic drainages, man-made drainages, vegetation, and erosional features. It must also include a description of current site uses and any operations at the site. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff, or contaminant transport must be included in this section.

3.7.2 Exploratory Drilling or Excavation Investigations

A section must describe the locations, methods, and depths of subsurface explorations. The description must include the types of equipment used, the logging procedures, exploration equipment, decontamination procedures, and conditions encountered that may have affected or limited the investigation. Samples obtained from all exploratory borings and excavations must be visually inspected and the soil or rock type classified in general accordance with ASTM D2487 (Unified Soil Classification System) and D2488, or AGI Methods for soil and rock classification. Detailed logs of each boring must be completed in the field by a qualified engineer or geologist.

A description of the site conditions observed during subsurface investigation activities must be included in this section, including soil horizon and stratigraphic information. Site plans showing the locations of all borings and excavations must be included in the Figures section of the report. Boring and test pit logs for all exploratory borings and test pits must be presented in an appendix or attachment to the report.

3.7.3 Subsurface Conditions

A section on subsurface conditions must describe known subsurface lithology and structures based on observations made during the current and previous subsurface investigations, including interpretation of geophysical logs and as-built drawings of man-made structures. A description of the known locations of pipelines, utility lines, and observed geologic structures must also be included in this section. A site plan showing boring and excavation locations and the locations of the site's above- and below-ground structures must be included in the Figures section of the report. In addition, cross-sections must be constructed, if appropriate, to provide additional visual presentation of site or regional subsurface conditions.

3.7.4 Monitoring Well Construction, Boring, or Excavation Abandonment

A section must describe the methods and details of monitoring well construction and the methods used to abandon or backfill exploratory borings and excavations. The description must include the dates of well construction, boring abandonment, or excavation backfilling. In addition, boring logs, test pit logs, and well construction diagrams must be included in an attachment or appendix. Well construction diagrams must be included with the associated boring logs for borings that are converted to monitoring wells.

3.7.5 Groundwater Conditions

A section must describe groundwater conditions observed beneath the subject site and relate local groundwater conditions to regional groundwater conditions. A description of the depths to water, aquifer thickness, and groundwater flow directions must be included in this section for alluvial groundwater, shallow perched groundwater, intermediate perched groundwater, and regional groundwater, as appropriate to the investigation. Figures showing well locations, surrounding area, groundwater elevations, and flow directions for each hydrologic zone must be included in the Figures section of the report.

3.7.6 Surface Water Conditions

A section must describe surface water conditions and include a description of surface water runoff, surface water drainage, surface water sediment transport, and contaminant transport in surface water as suspended load and as a dissolved phase in surface water via natural and man-made drainages, if applicable. A description of contaminant fate and transport must be included, if appropriate.

3.7.7 Subsurface Air and Soil Moisture Conditions

A section must describe subsurface air monitoring and sampling methods used during the site investigation. It must also describe observations made during the site investigation regarding subsurface flow pathways and the subsurface air-flow regime.

3.7.8 Materials Testing Results

A section must discuss the materials testing results, such as core permeability testing, grain size analysis, or other materials testing results. Sample collection methods, locations, and depths must also be included. Corresponding summary tables must be included in the Tables section of the report.

3.7.9 Pilot Testing Results

A section must discuss the results of any pilot testing. Pilot testing is typically conducted after initial subsurface investigations are completed and the need for additional investigation or remediation has been evaluated. Pilot testing, including aquifer testing and remediation system pilot testing, must be addressed through separate pilot test work plans and reports. The format for pilot test work plans and reports must be approved by the NMED prior to submittal.

3.8 Regulatory Criteria

A section must set forth the applicable cleanup standards, screening levels, and risk-based cleanup goals for each pertinent medium at the subject site. The appropriate cleanup levels for each site must be included if site-specific levels have been established at separate facility sites or units. A table summarizing the applicable cleanup standards must be included as part of the document. Alternately, the report may include applicable cleanup standards as a column in the data tables. Risk-based evaluation procedures, if used to calculate cleanup levels, must be presented in a separate document or in an appendix to this report. If cleanup levels calculated in a risk evaluation are employed, the risk evaluation document must be referenced and must include pertinent page numbers for referenced information.

3.9 Site Contamination

A section must provide a description of sampling intervals and methods for detection of surface and subsurface contamination in soils, rock, sediments, groundwater, surface water, and as vapor-phase contamination. Only factual information must be included in this section. Interpretation of the data must be reserved for the summary and conclusions sections of the report. Tables summarizing all sampling, testing, and screening results for detected contaminants must be prepared in a format approved by the NMED. The tables must be presented in the Tables section of the report.

3.9.1 Soil, Rock, and Sediment Sampling

A section must describe the sampling of soil, rock and sediment. It must include the dates, locations, and methods of sample collection, sampling intervals, sample logging methods, screening sample selection methods, and laboratory sample selection methods including the collection depths for samples submitted for laboratory analyses. A site plan showing the sample locations must be included in the Figures section of the report.

3.9.2 Sample Field Screening Results

A section must describe the field screening methods used during the investigation and the field screening results. Field screening results also must be presented in summary tables in the Tables section of the document. The limitations of field screening instrumentation and any conditions that influenced the results of field screening must be discussed in this subsection.

3.9.3 Soil, Rock, and Sediment Sampling Chemical Analytical Results

A section must briefly summarize the laboratory analyses conducted, the analytical methods and results and provide a comparison of the data to cleanup standards or established cleanup levels for the site. The laboratory results also must be presented in summary tables in the Tables section of the document. Field conditions and sample collection methods that could potentially affect the analytical results must be described in this section. If appropriate, soil analytical data must be presented with sample locations on a site plan and included in the Figures section of the report.

3.9.4 Subsurface Vapor Sampling

A section must describe the air and subsurface vapor sampling. It must describe the dates, locations, methods of sample collection, methods for sample logging, and methods for laboratory sample selection. A site plan showing all air and subsurface vapor sampling locations must be provided in the Figures section of the report.

3.9.5 Subsurface Vapor Field Screening Results

A section must describe the subsurface vapor field screening results. It must describe the field screening methods used for ambient air and subsurface vapors during the investigation and the field screening results. Field screening results must also be presented in summary tables in the Tables section of the report. The locations of ambient air and subsurface vapor screening sample collection must be presented on a site plan included in the Figures section of the report. The limitations of field screening instrumentation and any conditions that influenced the results of field screening must be discussed in this section.

3.9.6 Air and Subsurface Vapor Laboratory Analytical Results

This section must describe the results of air and subsurface vapor laboratory analyses. It must describe the air sampling laboratory analytical methods and results and provide a comparison of the data to applicable cleanup levels for the site. The rationale or purpose for altering or modifying the subsurface vapor sampling program outlined in the site investigation work plan also must be provided in this section. Field conditions that may have affected the analytical results during sample collection must be described in this section. Tables summarizing the air sample laboratory, field, and analytical QA/QC data; applicable cleanup levels; and modifications to the air sampling program must be provided in the Tables section of the report. Contaminant concentrations must be presented as data tables or as isoconcentration contours on a map included in the Figures section of the report.

3.10 Conclusions

A conclusions section must provide a brief summary of the investigation activities and a discussion of the conclusions of the investigation conducted at the site. In addition, this section must provide a comparison of the results to applicable cleanup levels, and to relevant historical investigation results and analytical data. Potential receptors, including groundwater, must be identified and discussed. An explanation must be provided with regard to data gaps. A risk assessment may be included as an appendix to the investigation report; however, the risk analysis must be presented in the risk assessment format described in Permit Section 6.5. References to the risk analysis must be presented only in the summary and conclusions sections of the Investigation Report.

3.11 Recommendations

A section must discuss the need for further investigation, corrective measures, risk assessment and monitoring, or recommendations for corrective action completed based on the conclusions provided in the Conclusions section. It must include explanations regarding additional sampling, monitoring, and site closure. A corresponding schedule for further action regarding the site must also be provided.

3.12 Tables

This section must provide the following summary tables. Data presented in the tables must include the current data, dates of data collection, analytical methods, detection limits, and significant data quality exceptions. All summary data tables must include only detected analytes and data quality exceptions that could potentially mask detections. The following tables must be included in investigation reports, as applicable:

a. tables summarizing regulatory criteria, background levels, and applicable cleanup levels; this information may be included in the analytical data tables instead of as separate tables;

b. tables summarizing field survey location data; separate tables must be prepared for well locations and individual medium sampling locations except where the locations are the same for more than one medium;

c. tables summarizing field screening and field parameter measurements of soil, sediment, vadose zone fluid, vadose zone vapor, vadose zone moisture, and groundwater, surface water, and air quality;

d. a table summarizing soil laboratory analytical data; it must include the analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

e. a table summarizing the groundwater elevations and depth-to-water data; the table must include the monitoring well depths and the screened intervals in each well;

f. a table summarizing the groundwater laboratory analytical data; the analytical data tables must include the analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

g. a table summarizing the surface water laboratory analytical data; the analytical data tables must include the analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

h. A table summarizing the air sample screening and laboratory analytical data; the data tables must include the screening instruments used, laboratory analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

i. tables summarizing the pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements; and

j. a table summarizing the materials testing data, if applicable.

3.13 Figures

All figures must be included with each investigation report, as appropriate. All figures must include a scale and a north arrow. An explanation must be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. All maps must have a date. A section must provide the following figures:

a. a vicinity map showing topography and the general location of the site relative to surrounding features and properties;

b. a site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and details; off-site well locations and other relevant features must be included on the site plan; additional site plans may be required to present the locations of relevant off-site well locations, structures and features;

c. figures showing boring, excavation, and sampling locations;

d. figures presenting soil sample field screening and laboratory analytical data;

e. figures displaying the locations of all newly installed and existing wells and borings;

f. figures presenting monitoring well locations, groundwater elevation data, and groundwater flow directions;

g. figures presenting groundwater laboratory analytical data, including any past data requested by the NMED; the chemical analytical data corresponding to each sampling location may be presented in table form on the figure or as an isoconcentration map;

h. figures presenting surface water sample locations and field measurement data including any past data requested by the NMED;

i. figures presenting surface water laboratory analytical data including any past data, if applicable; the laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure;

j. figures showing air and subsurface vapor sampling locations and presenting air and subsurface vapor quality data; the field screening or laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map;

k. figures presenting geologic cross-sections based on outcrop and borehole data; and

l. figures presenting pilot testing locations and data, where applicable, including site plans or graphic data presentation.

3.14 Appendices

Each investigation report must include the following appendices. Additional appendices may be necessary to present data or documentation not listed below.

3.14.1 Field Methods

An appendix must provide detailed descriptions of the methods used to acquire field measurements of each media that was surveyed or tested during the investigation. Methods must include, but are not limited to, exploratory drilling or excavation methods, the methods and types of instruments used to obtain field screening, field analytical or field parameter measurements, instrument calibration procedures, sampling methods for each medium investigated, decontamination procedures, sample handling procedures, documentation procedures, and a description of field conditions that affected procedural or sample testing results. Methods of measuring and sampling during pilot testing must be reported in this appendix, if applicable. Copies of IDW disposal documentation must be provided in a separate appendix.

3.14.2 Boring/Test Pit Logs and Well Construction Diagrams

An appendix must provide boring logs, test pit or other excavation logs, and well construction details. In addition, a key to symbols and a soil or rock classification system must be included in this appendix. Geophysical logs must be provided in a separate section of this appendix.

3.14.3 Chemical Analytical Program

Chemical analytical methods, a summary of data quality objectives, and a summary of data quality review procedures must be reported in an appendix. A summary of data quality exceptions and their effect on the acceptability of the field and laboratory analytical data with regard to the investigation and the site status must be included in this appendix, along with references to case narratives provided in the laboratory reports.

3.14.4 Chemical Analytical Reports

A section must include all laboratory chemical analytical data generated for the reporting period. The reports must include all chain-of-custody records and QA/QC results provided by the laboratory. The laboratory reports may be provided electronically in a format approved by the NMED and must be in the form of a final laboratory report. Laboratory report data tables may be submitted in Microsoft Excel format. Hard (paper) copies of the chain-of-custody forms must be submitted with the reports regardless of whether the final laboratory report is submitted electronically or in hard copy.

3.14.5 Other Appendices

Other appendices containing additional information must be included as required by the NMED or as otherwise appropriate.

4. Periodic Monitoring Report

The Permittee must use the following guidance for preparing periodic monitoring reports. The reports must present the results of periodic groundwater, surface water, vapor, and remediation system monitoring at the facility. The following sections provide a general outline for monitoring reports and the minimum requirements for reporting of periodic monitoring conducted at the facility. All data collected during each monitoring or sampling event in the reporting period must be included in the reports. In general, interpretation of data must be presented only in the background, conclusions, and recommendations sections of the reports. The other text sections of the reports must be reserved for presentation of facts and data without interpretation or qualifications.

4.1 Title Page

The title page must include the type of document, revision number if applicable, the facility name, the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible representative of the facility must be provided on the title page in accordance with the signature requirements in 40 CFR 270.11(b).

4.2 Executive Summary

The executive summary must provide a brief summary of the purpose, scope, and results of the monitoring conducted at the subject site during the reporting period. The facility, unit, SWMU, and AOC name(s) and location(s) must be included in the executive summary. In addition, this section must include a brief summary of conclusions based on the monitoring data collected.

4.3 Table of Contents

The table of contents must list all text sections, subsections, tables, figures, and appendices or attachments included in the report. The corresponding page numbers for the titles of each section of the report must be included in the table of contents.

4.4 Introduction

The introduction section must include the facility name and the unit name(s), location(s), and status (e.g. active operations, closed, corrective action). General information on the site usage and status must be included in this section. A brief description of the purpose of the monitoring, type of monitoring conducted, and the type of results presented in the report also must be provided in this section.

4.5 Scope of Activities

A section on the scope of activities must briefly describe all activities performed during the monitoring event or reporting period including field data collection, analytical testing, if applicable, and purge/decontamination water storage and disposal.

4.6 Regulatory Criteria

A section on regulatory criteria must provide information regarding applicable cleanup standards, risk-based screening levels, and risk-based cleanup goals for the site. A table summarizing the applicable cleanup standards, or inclusion of applicable cleanup standards as a column in the data tables, can be substituted for this section. The appropriate cleanup levels for each site must be included if site-specific levels have been established at separate sites. Risk-based evaluation procedures, if used to calculate cleanup levels, must either be included as an attachment or submitted as a separate document and referenced. The specific document and page numbers must be included for all referenced materials.

4.7 Monitoring Results

A section must provide a summary of the results of monitoring conducted at the site. This section must include the dates and times that monitoring was conducted, the measured depths to groundwater, directions of groundwater and vadose zone fluids flow, field air and water quality measurements, static pressures, field measurements, and a comparison to previous monitoring results. Field observations or conditions that may influence the results of monitoring must be reported in this section. Tables summarizing leachate and vapor-monitoring parameters, groundwater and vadose zone fluid elevations, depth-to-water measurements, and other field measurements may be substituted for this section. The tables must include all information required in Permit Section 6.4.11.

4.8 Chemical Analytical Data Results

A section must discuss the results of the chemical analyses. It must provide the dates of sampling and the analytical results. It must also provide a comparison of the data to previous results and to any cleanup standards or established cleanup levels for the site. The rationale or purpose for altering or modifying the sampling program must be provided in this section. A table summarizing the laboratory analytical data, QA/QC data, applicable cleanup levels, and modifications to the sampling program may be substituted for this section. The tables must include all information required in Permit Section 6.4.11.

4.9 Remediation System Monitoring

A section must discuss remediation system monitoring. It must summarize the remediation system's capabilities and performance. It must also provide monitoring data, treatment system discharge sampling requirements, and system influent and effluent sample analytical results. The dates of operation, system failures, and modifications made to the remediation system during the reporting period must also be included in this section. A summary table may be substituted for this section. The tables must include all information required in Permit Section 6.4.11.

4.10 Summary

A summary section must provide a discussion and conclusions of the monitoring conducted at the site. In addition, this section must provide a comparison of the results to applicable cleanup levels and to relevant historical monitoring and chemical analytical data. An explanation must be provided with regard to data gaps. A discussion of remediation system performance, monitoring results, modifications if applicable, and compliance with discharge requirements must be provided in this section. Recommendations and explanations regarding future monitoring, remedial actions, or site closure must also be included in this section.

4.11 Tables

A section must provide the following summary tables for the media sampled. With prior approval from the NMED, the Permittee may combine one or more of the tables. Data presented in the tables must include the current sampling and monitoring data, as well as data from the three previous monitoring events or, if data from less than three monitoring events is available, data acquired during previous investigations. Remediation system monitoring data also must be presented. The dates of data collection must be included in the tables. Summary tables may be substituted for portions of the text. The analytical data tables must include only detected analytes and data quality exceptions that could potentially mask detections. The following tables must be included, as applicable:

a. a table summarizing the regulatory criteria (a regulatory criteria text section may be substituted for this table or the applicable cleanup levels may be included in the analytical data tables);

b. a table summarizing groundwater and vadose zone fluid elevations, and depths to water data; the table must include the monitoring well depths, casing elevations, the screened intervals in each well, and the dates and times of measurements;

c. a table summarizing field measurements of surface water quality data, if applicable;

d. a table summarizing field measurements of subsurface vapor monitoring and soil moisture data (including historical vapor monitoring data as described above);

e. a table summarizing field measurements of groundwater and vadose zone fluid quality data (including historical water quality data as described above);

f. a table summarizing subsurface vapors chemical analytical data, if applicable (including historical analytical data as described above);

g. a table summarizing surface water chemical analytical data, if applicable (including historical surface water analytical data as described above);

h. a table summarizing groundwater and vadose zone fluid chemical analytical data (including historical groundwater analytical data as described above); and

i. a table summarizing remediation system monitoring data, if applicable (including historical remediation system monitoring data as described above).

4.12 Figures

A section must include the following figures. All figures must include a scale and north arrow. An explanation must be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. All figures must have a date. The following figures must be included, as applicable:

a. a vicinity map showing topography and the general location of the site relative to surrounding features or properties;

b. a facility site plan that presents pertinent site features and structures, well and piezometer neutron probe access tubes locations and remediation system location(s) and features; off-site well locations and pertinent features must be included on the site plan, if practical; additional site plans may be required to present the locations of relevant off-site well locations, structures, and features;

c. figures presenting the locations of neutron probe access tubes, monitoring and other well locations, groundwater and vadose zone fluid elevation data, and groundwater and vadose zone fluid flow directions;

d. figures presenting groundwater and vadose zone fluid analytical data for the current monitoring event; the analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map;

e. figures presenting surface water sampling locations and analytical data for the current monitoring period;

f. figures presenting vertical profiles of soil moisture content for neutron probe measurements for the current monitoring period;

g. figures presenting subsurface vapor sampling locations and analytical data for the current monitoring event; the analytical data corresponding to each sampling location may be presented in table form on the figure or as an isoconcentration map; and

h. figures presenting geologic cross-sections based on outcrop and borehole data, if applicable.

4.13 Appendices

Each monitoring report must include the following appendices. Additional appendices may be necessary to present data or documentation not listed below.

4.13.1 Field Methods

The report must include a section that outlines the methods used to acquire field measurements of groundwater and vadose zone fluid elevations, subsurface vapor, soil moisture, water quality data, subsurface vapor samples, vadose zone fluid samples, and groundwater samples. It must include the methods and types of instruments used to measure depths to water, air, headspace, or subsurface vapor parameters, soil moisture information, and water quality parameters. In addition, decontamination, well purging techniques, well sampling techniques, and sample handling procedures must be provided in this appendix. Methods of measuring and sampling remediation systems must be reported in this section, if applicable. Purge and decontamination water storage and disposal methods must also be presented in this appendix. Copies of purge and decontamination water disposal documentation must be provided in a separate appendix.

4.13.2 Chemical Analytical Program

An appendix must discuss the analytical program. It must include the analytical methods, a summary of data quality objectives, and data quality review procedures. A summary of data quality exceptions and their effect on the acceptability of the analytical data with regard to the monitoring event and the site status must be included in this appendix along with references to case narratives provided in the laboratory reports.

4.13.3 Chemical Analytical Reports

An appendix must include all laboratory chemical analytical data generated for the reporting period. The data may be submitted electronically on a compact disc in Microsoft Excel or other format acceptable to the NMED. The reports must include all chain-of-custody records and QA/QC results provided by the laboratory. Hard (paper) copies of all chain-of-custody records must be submitted as part of this appendix.

5. Risk Assessment Report

The Permittee must prepare risk assessment reports for sites requiring corrective action at the facility using the format described below. This section provides a general outline for risk assessments and also sets forth the minimum requirements for describing risk assessment elements. In general, interpretation of data must be presented only in the background, conceptual site model, and conclusions and recommendations sections of the reports. The other text sections of the risk assessment report must be reserved for presentation of sampling results from all investigations, conceptual and mathematical elements of the risk assessment, and presentations of toxicity information and screening values used in the risk assessment. The human health and ecological risk assessments must be presented in separate sections, but the general risk assessment outline applicable to both sections is provided below.

5.1 Title Page

The title page must include the type of document, revision number if applicable, the facility name, the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible representative of the facility must be provided on the title page in accordance with the signature requirements in 40 CFR 270.11(b).

5.2 Executive Summary

The executive summary section must provide a brief summary of the purpose and scope of the risk assessment of the subject site. The executive summary must also briefly summarize the conclusions of the risk assessment. The facility, unit, SWMU, or AOC name(s) and location(s) must be included in the executive summary.

5.3 Table of Contents

The table of contents must list all text sections, subsections, tables, figures, and appendices or attachments included in the risk assessment. The corresponding page numbers for the titles of each unit of the report must be included in the table of contents.

5.4 Introduction

The introduction section must include the facility name, unit name(s) and location(s), and unit status (e.g., active operations, closed, corrective action). General information on the current site usage and status must be included in this section.

5.5 Background

The background section must describe relevant background information. This section must briefly summarize historical site uses including the locations of current and former site structures and features. A labeled figure must be included in the document showing the locations of current and former site structures and features.

5.5.1 Site Description

A section must provide a description of current site topography, features, and structures including a description of drainages, erosional features, current site uses, and other data relevant to assessing risk at the site. Depth to groundwater, vadose zone fluids, and directions of groundwater and vadose zone fluids flow must be included in this section. The presence and location of surface water bodies such as springs or wetlands must be noted in this section. Photos of the site may be incorporated into this section, if desired. Ecological features of the site must be described here, including type and amount of vegetative cover, observed and expected wildlife receptors, and level of disturbance of the site. A topographical map of the site and general vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features must be included in the Figures section of the document.

5.5.2 Sampling Results

A section must include a summary of the history of releases of contaminants, known and possible sources of contamination, and the vertical and lateral extent of contamination present in each media. This section must include summaries of sampling results of all investigations, including site plans (included in the Figures section of the document), showing locations of detected contaminants. This section must reference pertinent figures, data summary tables, and citations for references to previous reports. References to previous reports must include page, table, and figure numbers for referenced information. Summaries of sampling data for each constituent must include the maximum value detected, the detection limit, the 95% UCL of the mean value detected (if applicable to the data set) and whether that 95% UCL of the mean was calculated based on a normal or lognormal distribution. Background values used for comparison to inorganic constituents at the site must be presented in this subsection. The table of background values must appear in the Tables section of the document and include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, UTL). This section must also include a discussion of how “non-detect” sample results were handled in the averaging of data.

5.6 Conceptual Site Model

A section must present the conceptual site model. It must include information on the expected fate and transport of contaminants detected at the site. This section must provide a list of all sources of contamination at the site. Sources that are no longer considered to be ongoing but represent the point of origination for contaminants transported to other locations must be included. The discussion of fate and transport must address potential migration of each contaminant in each medium, potential breakdown products and their migration, and anticipated pathways of exposure for human or ecological receptors. Diagrammatic representations of the conceptual site model must appear in the Figures section of the document.

For human health risk assessments, the conceptual site model must include residential land use as the future land use for all risk assessments. In addition, site-specific future land use may be included, provided that written approval to consider a site-specific future land use has been obtained from the NMED prior to inclusion in the risk assessment. If a site-specific future land use scenario appears in the risk assessment, all values for exposure parameters and the source of those values must be included in table format and presented in the Tables section of the document.

Conceptual site models presented for ecological risk assessments must identify assessment endpoints and measurement receptors for the site. The discussion of the model must explain how the measurement receptors for the site are protective of wildlife receptors.

5.7 Risk Screening Levels

A section must present the actual screening values used for each contaminant for comparison to all human health and ecological risk screening levels. A discussion of the methods used to calculate the screening levels in accordance with Permit Section 3.5 and any variances from those procedures must be included in this Section. If no valid toxicological studies exist for the receptor or contaminant, the contaminant and receptor combination must be addressed using qualitative methods. If an approved site-specific risk scenario is used for the human health risk assessment, this section must include all toxicity information and exposure assessment equations used for the site-specific scenario, as well as the sources for that information. Other regulatory levels applicable to screening the site, such as drinking water MCLs, must also be included in this section.

5.8 Risk Assessment Results

This section must present all risk values, Hazard Quotients (HQs), and Hazard Indices (HIs) for human health under projected future residential scenario and any site-specific scenarios. This section must also present the HQ and HI for each contaminant for each ecological receptor. IN addition, this section must include discussion of qualitative, semi-quantitative, and quantitative uncertainty in the risk assessment and estimate the potential impact of the various uncertainties.

5.9 Conclusions and Recommendations

This section must include an interpretation of the results of the risk assessment and any recommendations for future disposition of the site. This section may include additional information and considerations that the Permittee believes are relevant to the analysis of the site.

5.10 Tables

Data presented in the summary tables must include information on detection limits and significant data quality exceptions. All data tables must include only detected analytes and data quality exceptions that could potentially mask detections. A section must provide the following summary tables, as appropriate. With prior approval from the NMED, the Permittee may combine one or more of the tables:

a. a table presenting background values used for comparison to inorganic constituents at the site; the table must include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, UTL, or maximum);

b. a table summarizing sampling data must include, for each constituent, all detected values above background, the maximum value detected, the 95 percent UCL of the mean value detected (if applicable to the data set), and whether that 95 percent UCL of the mean was calculated based on a normal or lognormal distribution;

c. a table of all screening values used and the sources of those values;

d. a table presenting all risk values, HQs, and HIs under projected future residential scenario;

e. a table presenting all risk values, HQs, and HIs under approved additional site- specific future land use scenario; and

f. a table presenting the HQ and HI for each contaminant for each ecological receptor.

5.11 Figures

This section must present the following figures for each site, as appropriate. With prior approval from the NMED, the Permittee may combine one or more of the figures. All figures must include a scale and a north arrow. An explanation must be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. The following figures must be included, as applicable:

a. a vicinity map showing topography and the general location of the site relative to surrounding features or properties;

b. for human health risk assessments, a site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and its details; off-site well locations and other relevant features must be included on the site plan if practical; additional site plans may be required to present the locations of relevant off-site wells, structures, and features;

c. for ecological risk assessments, a topographical map of the site and general vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features; and

d. conceptual site model diagrams for both human health and ecological risk assessments.

5.12 Appendices

Appendices may be included to present additional relevant information for the risk analysis such as the results of statistical analyses of data sets and comparisons of data, ecological checklists for the site, full sets of results of all sampling investigations at the site, or other data as appropriate.

6. Corrective Measures Evaluation

The Permittee must prepare corrective measures evaluations for sites requiring corrective measures using the format described below. This section provides a general outline for corrective measures evaluations and sets forth the minimum requirements for describing corrective measures when preparing these documents. All investigation summaries, site condition descriptions, corrective action goals, corrective action options, remedial options selection criteria, and schedules must be included in the corrective measures evaluations. In general, interpretation of historical investigation data must be presented only in the background sections of the corrective measures evaluations. At a minimum, detections of contaminants encountered during previous site investigations must be presented in the corrective measures evaluations in table format with an accompanying site plan depicting sample locations. The other text sections of the corrective measures evaluations must be reserved for presentation of corrective action-related information regarding anticipated or potential site-specific corrective action options and methods relevant to the project. The general corrective measures evaluation outline is provided below.

6.1 Title Page

The title page must include the type of document, revision number if applicable, the facility name, the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible facility representative must be provided on the title page in accordance with the signature requirements in 40 CFR 270.11(b).

6.2 Executive Summary

The executive summary must provide a brief summary of the purpose and scope of the corrective measures evaluation to be conducted at the site. The executive summary or abstract must also briefly summarize the conclusions of the evaluation. The facility, unit, SWMU, or AOC name(s) and location(s) must be included in the executive summary.

6.3 Table of Contents

The table of contents must list all text sections, subsections, tables, figures, and appendices or attachments included in the corrective measures evaluation. The corresponding page numbers for the titles of each section of the report must be included in the table of contents.

6.4 Introduction

The introduction section must include the facility name, unit name(s) and location(s) and unit status (e.g., active operations, closed, corrective action). General information on the current site use and status must be included in this section. A brief description of the purpose of the corrective measures evaluation and the corrective action objectives for the project also must be provided in this section.

6.5 Background

The background section must describe the relevant background information. This section must briefly summarize historical site activities including the locations of current and former site structures and features. A labeled figure must be included in the document showing the locations of current and former site structures and features. The locations of subsurface features such as pipelines, underground tanks, utility lines, and other subsurface structures must be included in the background section and labeled on the site plan.

This section must include contaminant and waste characteristics, a brief summary of the history of contaminant releases, known and possible sources of contamination, and the vertical and lateral extent of contamination present in each medium. This section must include brief summaries of results of previous investigations, including references to pertinent figures, data summary tables, and text in previous reports. References to previous reports must include page, table, and figure numbers for referenced information. Summary tables and site plans showing relevant investigation locations must be referenced and included in the Tables and Figures sections of the document, respectively.

6.6 Site Conditions

6.6.1 Surface Conditions

A section on surface conditions must describe current and historic site topography, features, and structures, including a description of topographic drainages, man-made drainages, vegetation, and erosional features. It must also include a description of current uses of the site and any current operations at the site. This section must also include a description of those features that could potentially influence corrective action option selection or implementation such as archeological sites, wetlands, or other features that may affect remedial activities. In addition, descriptions of features located in surrounding sites that may have an effect on the subject site regarding sediment transport, surface water runoff, or contaminant transport must be included in this section. A site plan displaying the locations of all pertinent surface features and structures must be included in the Figures section of the corrective measures evaluation.

6.6.2 Subsurface Conditions

A section on subsurface conditions must describe the site conditions observed during previous subsurface investigations. It must include relevant soil horizon and stratigraphic information, groundwater and vadose zone fluid conditions, fracture data, and subsurface vapor information. A site plan displaying the locations of all borings and excavations advanced during previous investigations must be included in the Figures section of the corrective measures evaluation.

6.7 Potential Receptors

6.7.1 Sources

A section must provide a list of all sources of contamination at the site where corrective measures are to be considered or are required. Sources that are no longer considered to be releasing contaminants at the site, but may be the point of origination for contaminants transported to other locations, must be included in this section.

6.7.2 Pathways

A section must describe potential migration pathways that could result in either acute or chronic exposures to contaminants. It must include such pathways as utility trenches, paleochannels, surface exposures, surface drainages, stratigraphic units, fractures, structures, and other features. The migration pathways for each contaminant and each medium must be tied to the potential receptors for each pathway. A discussion of contaminant characteristics relating to fate and transport of contaminants through each pathway must also be included in this section.

6.7.3 Receptors

A section must provide a listing and description of all anticipated potential receptors that could possibly be affected by the contamination present at the site. Potential receptors must include human and ecological receptors, groundwater, and other potential receptors. This section must identify relevant pathways, such as pathways that could divert or accelerate the transport of contamination to human receptors, ecological receptors, and/or groundwater.

6.8 Regulatory Criteria

A section must set forth the applicable cleanup standards, risk-based screening levels, and risk-based cleanup goals for each medium at the site. The appropriate cleanup levels for each site must be included, if site-specific levels have been established. A table summarizing the applicable cleanup standards must be included as part of the document. Alternately, the report may include applicable cleanup standards as a column in the data tables. If cleanup levels calculated in a risk evaluation are employed, the risk evaluation document must be referenced including pertinent page numbers for referenced information.

6.9 Identification of Corrective Measures Options

A section must identify and describe potential corrective measures for source, pathway, and receptor controls. Corrective measures options must include the range of available options including, but not limited to, a no action alternative, institutional controls, engineering controls, in-situ and onsite remediation alternatives, complete removal, and any combination of alternatives that would potentially achieve cleanup goals.

6.10 Evaluation of Corrective Measures Options

A section must provide an evaluation of the corrective measures options identified in Section 6.6.9 above. The evaluation must be based on the applicability, technical feasibility, effectiveness, implementability, impacts to human health and the environment, and cost of each option. A table summarizing the corrective measures alternatives and the criteria listed below must be included in the Tables section of this document. The general basis for evaluation of corrective measures options is described below.

6.10.1 Applicability

Applicability addresses the overall suitability for the corrective action option for containment or remediation of the contaminants in the relevant media with regard to protection of human health and the environment.

6.10.2 Technical Feasibility

Technical feasibility describes the uncertainty in designing, constructing, and operating a specific remedial alternative. The description must include an evaluation of historical applications of the remedial alternative including performance, reliability, and minimization of hazards.

6.10.3 Effectiveness

Effectiveness assesses the ability of the corrective measure to mitigate the measured or potential impact of contamination in a medium under the current and projected site conditions. The assessment also must include the anticipated duration for the technology to attain regulatory compliance. In general, all corrective measures described above will have the ability to mitigate the impacts of contamination at the site, but not all remedial options will be equally effective at achieving the desired cleanup goals to the degree and within the same time frame as other options. Each remedy must be evaluated for both short-term and long-term effectiveness.

6.10.4 Implementability

Implementability characterizes the degree of difficulty involved during the installation, construction, and operation of the corrective measure. Operation and maintenance of the alternative must be addressed in this section.

6.10.5 Human Health and Ecological Protectiveness

This category evaluates the short-term (remedy installation-related) and long-term (remedy operation-related) hazards to human health and the environment of implementing the corrective measure. The assessment must include whether the technology will create a hazard or increase existing hazards and the possible methods of hazard reduction.

6.10.6 Cost

A section must discuss the anticipated cost of implementing the corrective measure. The costs must be divided into: 1) capital costs associated with construction, installation, pilot testing, evaluation, permitting, and reporting of the effectiveness of the alternative; and 2) continuing costs associated with operating, maintaining, monitoring, testing, and reporting on the use and effectiveness of the technology.

6.11 Selection of Preferred Corrective Measure

The Permittee must propose the preferred corrective measures at the site and provide a justification for the selection in this section. The proposal must be based upon the ability of the remedial alternative to: 1) achieve cleanup standard objectives in a timely manner; 2) protect human and ecological receptors; 3) control or eliminate the sources of contamination; 4) control migration of released contaminants; and 5) manage remediation waste in accordance with State and Federal regulations. The justification must include the supporting rationale for the remedy selection, based on the factors listed in Permit Section 6.6.10, and a discussion of short- and long-term objectives for the site. The benefits and possible hazards of each potential corrective measure alternative must be included in this section.

6.12 Design Criteria to Meet Cleanup Objectives

The Permittee must present descriptions of the preliminary design for the selected corrective measures in this section. The description must include appropriate preliminary plans and specifications to effectively illustrate the technology and the anticipated implementation of the remedial option at the site. The preliminary design must discuss the design life of the alternative and provide engineering calculations for proposed remediation systems.

6.13 Schedule

A section must set forth a proposed schedule for completion of remedy-related activities such as bench testing, pilot testing, construction, installation, remedial excavation, cap construction, installation of monitoring points, and other remedial actions. The anticipated duration of corrective action operations and the schedule for conducting monitoring and sampling activities must also be presented. In addition, this section must provide a schedule for submittal of reports and data to the NMED, including a schedule for submitting all status reports and preliminary data.

6.14 Tables

A section must present the following summary tables, as appropriate. Data presented in the summary tables must include information on dates of sample collection, analytical methods, detection limits, and significant data quality exceptions. All data tables must include only detected analytes and data quality exceptions that could potentially mask detections. The following summary tables must be included in the corrective measures evaluations, as appropriate:

a. a table summarizing regulatory criteria, background, and the applicable cleanup standards;

b. a table summarizing historical field survey location data;

c. tables summarizing historical field screening and field parameter measurements for each media;

d. tables summarizing historical soil, rock, or sediment laboratory analytical data; the summary tables must include the analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

e. a table summarizing historical groundwater elevation and depth to water data; the table must include the monitoring well depths and the screened intervals in each well;

f. tables summarizing historical groundwater and vadose zone laboratory analytical data; the analytical data tables must include the analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

g. tables summarizing historical surface water laboratory analytical data; the analytical data tables must include the analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

h. tables summarizing historical air sample screening and analytical data; the data tables must include the screening instruments used, laboratory analytical methods, detection limits, and significant data quality exceptions that would influence interpretation of the data;

i. tables summarizing historical pilot or other testing data, if applicable, including units of measurement and types of instruments used to obtain measurements;

j. a table summarizing the corrective measures alternatives and evaluation criteria; and

k. a table presenting the schedule for installation, construction, implementation, and reporting of selected corrective measures.

6.15 Figures

This section must present the following figures for each site, as appropriate. All figures must include a scale. All plan view figures must include a north arrow. An explanation must be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. All figures must contain a date. The following figures must be included, as applicable:

a. a vicinity map showing topography and the general location of the subject site relative to surrounding features or properties;

b. a unit site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and details; off-site well locations and other relevant features must be included on the site plan if practical; additional site plans may be required to present the locations of relevant off-site well locations, structures, and features;

c. figures showing historical soil boring locations, excavation locations, and sampling locations;

d. figures presenting historical soil sample field screening and laboratory analytical data, if appropriate;

e. figures showing all existing wells including vapor monitoring wells and piezometers; the figures must present historical groundwater elevation data and indicate groundwater flow directions;

f. figures presenting historical groundwater laboratory analytical data including past data, if applicable; the analytical data corresponding to each sampling location may be presented as individual concentrations, in table form on the figure, or as an isoconcentration map;

g. figures presenting historical surface water sample locations and analytical data including past data, if applicable; the laboratory analytical data corresponding to each sampling location may be presented as individual concentrations or in table form on the figure;

h. figures presenting historical air sampling locations and presenting air quality data; the field screening or laboratory analytical data corresponding to each sampling location may be presented as individual concentrations, in table form on the figure or as an isoconcentration map;

i. figures presenting historical pilot or other test locations and data, where applicable, including site plans or graphic data presentation;

j. figures presenting geologic cross-sections based on outcrop and borehole data, if applicable;

k. figures presenting the locations of existing and proposed remediation systems;

l. figures presenting existing remedial system design and construction details; and

m. figures presenting preliminary design and construction details for preferred corrective measures.

6.16 Appendices

Each corrective measures evaluation must include, as appropriate, as an appendix, the management plan for waste, including investigation derived waste, generated as a result of construction, installation, or operation of remedial systems or activities conducted. Each corrective measures evaluation must include additional appendices presenting relevant additional data, such as pilot or other test or investigation data, remediation system design specifications, system performance data, or cost analyses as necessary.

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

14 Aug 20

Colonel Ryan S. Nye, USAF
Vice Commander
377th Air Base Wing
2000 Wyoming Blvd SE
Kirtland AFB NM 87117

Mr. Kevin Pierard and Mr. Dave Cobrain
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building I
Santa Fe NM 87505

Dear Mr. Pierard

The Air Force respectfully requests a meeting with the New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB) in the 31 July 2020 letter to discuss comments #5, #7, and #8 within the 26 May 2020 letter *"Disapproval, Work Plan for Shallow Soil Vapor Sampling, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-11l, November 2019, Kirtland Air Force Base, New Mexico EPA ID# NM9570024423 HWB-KAFB-19-014"*. The meeting, once scheduled and conducted, will inform the Air Force regarding the appropriate path forward in addressing comments and making revisions to the work plan based on the above referenced disapproval letter. NMED-HWB requested a revised work plan by 28 August 2020. Additional time will be required for NMED-HWB review of the draft response to comments table provided with the Air Force 31 July 2020 letter, scheduling and conducting a meeting to discuss the above referenced comments, and NMED-HWB preparation of a formal response regarding the discussion outcome. Furthermore, the preparation, review, and coordination of the revised work plan for submission to the NMED-HWB will require additional time. Therefore, Kirtland Air Force Base (AFB) respectfully requests a one hundred eighty (180) day extension request for the submission of the revised work plan from 28 August 2020 to 24 February 202 I. In addition, the Air Force understands the NMED-HWB identifies a review time for an investigative work plan as two hundred seventy (270) days as codified in 20.4.2 New Mexico Administrative Code.

Upon NMED-HWB approval of the revised work plan, the installation and sampling of the soil vapor monitoring wells will coincide with the seasonal summer and winter sampling events as specified in the work plan.

Kirtland AFB appreciates the valued working relationship with you and your department. If you have any questions regarding this request, please contact Mr. Sheen Kottkamp at (806) 463-0811 or email sheen.kottkamp.l@us.af.mil.

Sincerely

RYAN S. NYE, Colonel, USAF
Vice Commander

cc:
NMED HWB (Pierard, Cobrain), letter and electronic
NMED RPD (Stringer), electronic only
EPA Region 6 (King, Ellinger), electronic only
SAF/IEE (Lynnes), electronic only
AFCEC/CZ (Cash, Kottkamp, Segura), electronic only
USACE-ABQ District Office (Moayyad, Phaneuf, Dreeland, Cordova, Kunkel), electronic only
Public Info Repository, Administrative Record/Information Repository (AR/IR) and File

40 CFR 270.11
DOCUMENT CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Ryan S. Nye

RYAN S. NYE, Colonel, U.S. Air Force
Vice Commander, 377th Air Base Wing

14 Aug 20
Date

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6313
Phone (505) 476-6000 Fax (505) 476-6030
www.env.nm.gov

Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 3, 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil Engineering Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: EXTENSION REQUEST – BULK FUELS FACILITY SPILL SHALLOW SOIL VAPOR SAMPLING WORK PLAN KIRTLAND AIR FORCE BASE, NEW MEXICO EPA ID # NM9570024423 HWB-KAFB-19-005

Dear Colonel Miller and Colonel Acosta:

The New Mexico Environment Department (NMED) received the U.S. Air Force (Permittee) Kirtland Air Force Base (Facility) *Extension Request for the revised Bulk Fuels Facility Spill Shallow Soil Vapor Sampling Work Plan* (Request) on August 8, 2020. The revised Work Plan and response to NMED's comments was due on August 28, 2020. The Request states that the Permittee proposes to conduct an additional meeting with NMED to discuss the comments provided in NMED's May 26, 2020 Disapproval letter.

NMED hereby grants the Permittee's request for a time extension. As requested, the Permittee must submit the revised Shallow Soil Vapor Sampling Work Plan no later than **February 24, 2021**.

If you have any questions regarding this letter, please contact me at (505) 476-6035.

Sincerely,

Kevin M. Pierard, Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
L. Andress, NMED HWB
B. Wear, NMED HWB
L. King, EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 and Reading

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6313
Phone (505) 476-6000 Fax (505) 476-6030
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Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

SEP 2 3 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil Engineer Division
2050 Wyoming Blvd SE, Suite 116
Kirtland AFB, NM 87117

RE: DISAPPROVAL
BIOVENTILATION CONSTRUCTION AND INITIATION REPORT
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNIT ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-20-001

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of Kirtland Air Force Base's (Permittee) *Bioventilation Construction and Initiation Report* (Report), dated January 2020. NMED has reviewed the Report and deficiencies were identified throughout the Report. NMED hereby issues this Disapproval with comments.

Although NMED is disapproving the Report we recommend continuation of the long-term pilot test. Continuation of data collection will help address many of the attached comments and will assist in ascertaining the long-term effectiveness of the bioventing technology.

The Permittee must submit a revised Report that addresses all comments contained in this letter. Two hard copies and an electronic version of the revised Report must be submitted to the NMED. Please include a redline-strikeout version in electronic format showing where all revisions to the Report have been made. The revised Report must be accompanied with a response letter that details where all revisions have been made, cross-referencing NMED's numbered comments. The Revised Report must be submitted to NMED no later than **April 30, 2021.**

Should you have any questions or wish to meet with us to discuss these comments, please contact me at (505) 476-6035.

Sincerely,

Kevin Pierard Digitally signed by Kevin Pierard Date: 2020.09.23 12:40:15 -06'00'

Kevin Pierard
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
M. Suzuki, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

Attachment

SPECIFIC COMMENTS

1. **Executive Summary, ES-1, Installation of Bioventing Monitoring Wells, page ES-1**

   Permittee Statement: "Each SVMW is comprised of six 0.75-inch outside diameter nested vapor probes with 2 feet (ft) of screen each targeting different depths of the vadose zone. Vapor probes were installed at depths varying between 102 and 262.5 ft below ground surface to facilitate discrete vertical monitoring of the vadose zone."

   NMED Comment: According to the *Bioventing Respiration Pilot Testing Procedure* (Procedure), dated September 2018, lengths of the screened intervals for the nested vapor probes were indicated as 2.5 feet, rather than two feet. Clarify whether the vapor probes have two- or 2.5-feet screened intervals in the revised Report. Revise all applicable sections of the Report, as appropriate. In addition, the depths of both wells KAFB-106V1 and KAFB-106V2 were reported as 102.5 to 272.5 feet below ground surface (bgs) in Table 1-1. Provide an explanation for or resolve the discrepancies in the revised Report.

2. **Section 1.2, Bioventing Pilot Test Objectives and Scope, page 1-1**

   Permittee Statement: "The bioventing pilot test is being performed to evaluate the feasibility of this technology for the Corrective Measures Evaluation Report."

   NMED Comment: According to Table 3-12, *Summary of Hydrocarbon Analytical Results*, the elevated TPH-GRO concentrations in soil vapor samples collected from all pilot test monitoring wells indicate that free phase and adsorbed hydrocarbons may be present in the vicinity of the pilot test area. In order to maximize the effectiveness of remediation, delineation of the extent of hydrocarbon contamination is crucial regardless of the technology that is ultimately proposed through corrective measures evaluation (CME).

   In order to effectively remediate the extent of hydrocarbon contamination where free phase hydrocarbon is present, the Permittee must clarify whether the extent has been fully delineated. Either confirm that the extent of contamination has been fully delineated through previous investigations in the revised Report or submit a work plan to delineate the extent of the vadose zone contamination (e.g., Laser-Induced Fluorescence), if necessary. If the work plan is deemed necessary, submit the work plan no later than **July 30, 2021**.

3. **Section 1.2, Bioventing Pilot Test Objectives and Scope, page 1-1**

   Permittee Statement: "The rate of oxygen utilization is directly proportional to the aerobic biodegradation rate of fuel hydrocarbons in the subsurface and can be used as an indication of the effectiveness of bioventing to achieve site cleanup."

NMED Comment: The reduction of oxygen levels in monitoring and injection wells does not necessarily mean that all of the oxygen is utilized for biodegradation of hydrocarbons. Although oxygen utilization may be an indicator, it is not clear that this is directly proportional due to a variety of factors including diffusion of oxygen-depleted soil gas from soil pore space and dissipation of injected air toward the low-pressure gradient outside of the test cell boundary. Other monitoring parameters (e.g., isotope analysis) may be necessary to confirm evidence of biodegradation. Because the Permittee continues to evaluate the effectiveness of the bioventing technology through the long-term pilot testing, additional monitoring parameters may be useful to confirm the occurrence of biodegradation. Evaluate the necessity of additional monitoring parameters to confirm evidence of biodegradation and provide a discussion in the revised Report (see Comment 34). Evidence of biodegradation does not necessarily indicate its effectiveness as a remedial alternative. In order for this technology to be considered as viable remedial alternative, the pilot test must demonstrate reduction of hydrocarbon concentrations.

4. **Section 1.2, Bioventing Pilot Test Objectives and Scope, page 1-2, and Section 5.4, Bioventing Pilot Test Performance Assessment, page 5-2**

Permittee Statements: "Status reports will be provided quarterly as an appendix to the appropriate Groundwater Monitoring Report."
and,
"Respiration and analytical data collected from each quarter will be reported in the appropriate quarterly groundwater monitoring report."

NMED Comment: The pilot test is not associated with groundwater remediation and groundwater is not monitored as part of this test. Inclusion of the status report in an appendix of a separate report is not appropriate. Status reports must be submitted separately from the quarterly groundwater monitoring reports. Please revise the Report accordingly.

5. **Section 2, Background Information, page 2-1**

NMED Comment: A discussion regarding fuel release (e.g., release date range, contaminants of concern, area where fuel was released, range of estimated volumes released) is not included in this section of the Report. Please include the discussion in the revised Report.

6. **Section 2.2, Site History, page 2-1**

   Permittee Statement: "Impacted soil was excavated in the release area to a depth of approximately 20 feet (ft) below ground surface in the area shown on Figure 1-2. Soil vapor extraction activities were performed at the site between 2003 and 2015 to reduce the mass of contaminants in the vadose zone."

   NMED Comment: Figure 1-2, *Bioventing Pilot Test Area,* does not depict the area where contaminated soil was excavated. Please revise the figure or include a new figure to present the area where the soil was excavated. Additionally, explain whether the soil vapor extraction (SVE) system is still present at the Bulk Fuels Facility Site. Even if the SVE system alone did not achieve effective mass removal, the combination of SVE and bioventing technologies may increase the effectiveness of each technology. Please evaluate the feasibility and benefits of operating both systems concurrently and provide a discussion in the revised Report.

7. **Section 2.3, Ongoing Soil Vapor Monitoring, page 2-1**

   Permittee Statement: "A total of 284 soil vapor monitoring points at 56 soil vapor monitoring locations are being sampled semiannually. The results from the vapor monitoring data indicate that the majority of the petroleum hydrocarbon concentrations found in the vadose zone are located in the vicinity of the release area."

   NMED Comment: Please include a separate figure presenting locations of all soil vapor monitoring wells with designations in the revised Report.

8. **Section 3.2, Bioventing Equipment Installation, page 3-1**

   Permittee Statements: "The [1.5-horsepower regenerative] blower unit provides injection air to the SVEWs through a 2-inch polyethylene conveyance line that manifolds to the individual SVEWs."
   and,
   "Due to high head losses associated with high volume injection flow rates through the 0.5-inch diameter SVMWs, the regenerative blower could not be used for air injection due to pressure limitations. As a result, injection air is provided to the SVMWs via two 1-horsepower Gast rotary vane pumps."

   NMED Comment: It is not clear whether or not the 1.5-horsepower regenerative blower was concurrently used with rotary vane pumps during the pilot test. Please provide a clarification in the revised Report. In addition, it is not clear whether the two 1-horsepower rotary pumps provided sufficient power to deliver air to SVMWs or all wells. Please provide head loss calculations to demonstrate that the pumps were adequate in the revised Report.

9. Section 3.3, Baseline Respirometry and Vapor Sampling, page 3-2

Permittee Statement: "Well purging was performed by removing one well volume (casing volume plus the filter pack pore space volume of the screened interval) from the monitoring well utilizing a Gast rotary vane pump."

NMED Comment: The rotary vane pumps were used to inject air into SVMWs. Explain whether the same pump was used for the purpose of purging in the revised Report.

10. Section 3.3, Baseline Respirometry and Vapor Sampling, page 3-2

Permittee Statement: "Analytical samples were collected using 6-liter Summa cannisters and..."

NMED Comment: The September 2018 Procedure indicates that the size of Summa cannisters proposed to be used was one liter. Explain the basis for the deviation. All deviations from the work plan must be described in the revised Report. Please revise the Report to include a section that discusses deviations from the work plan.

11. Section 3.4, Respirometry Field Testing, page 3-2, and Section 4.1, Respiration Data Analysis, page 4-1

Permittee Statements: "The water injection was performed on May 23 and 24, 2019. After the water was injected, the test cells were allowed approximately 4 weeks to acclimate prior to the start of the wet respiration testing."
and,
"The results suggest little or no change to soil vapor humidity as the result of moisture addition."

NMED Comment: The September 2018 Procedure states, "[t]he water is radially forced into the formation." The pressurized water injection method was unlikely to distribute moisture radially throughout the pore space. Rather, injected water likely followed the least resistant (preferential) flow paths. The water may have infiltrated into deeper soils by gravity rather than providing moisture to soils in the target pore space during the acclimation period. As a result, changes to soil vapor humidity were not observed after water injection. The Executive Summary, *ES-4 Respiration Testing,* page ES-2, states, "[o]xygen utilization rates were marginally higher during the dry respiration testing compared to the wet respiration testing indicating that the moisture addition did not increase the rate of biodegradation." Because the water was likely not evenly distributed within the test cell, the results obtained from wet respiration test are not reliable and must not be used for decision-making purposes. The Permittee must not draw any conclusions related to the wet respiration test. In addition, the Executive Summary, *ES-4 Respiration Testing,* page ES-2, states, "[t]he need to add moisture will be further assessed during the long-term bioventing pilot test." NMED agrees that further assessment through the long-term pilot test is appropriate and supports the injection of cool mist rather than pressurized water. Mist injected with air may provide more uniform distribution of moisture in the formation. Propose this approach in the revised Report.

12. Section 3.4, Respirometry Field Testing, page 3-2

Permittee Statement: "No measurable degradation was observed due to the high concentration of hydrocarbons and the limited amount of ambient air supplied to the subsurface."

NMED Comment: Tables 4-2 through 4-13 provide volatile organic compound (VOC) concentrations measured in the monitoring wells. Air was continuously injected for more than 30 days between October 7 and November 5, 2019. However, the VOC concentrations appear to be persistent and relatively unchanged from the baseline levels in most monitoring locations. Considering the immediate effect of dilution with air, it is not clear why hydrocarbon concentrations are not declining after 30 days of air injection. It is possible that a major fraction of the injected air may have followed the preferential flow paths (e.g., fractures) and did not directly flow into the monitoring locations. Please evaluate the causes of persistent VOC concentrations and provide a discussion in the revised Report.

13. Section 3.4.1.1, [Dry Respirometry Testing] Air Injection and Pressure Monitoring, page 3-3, Section 3.4.3.1, [Wet Respirometry Testing] Air Injection and Pressure Monitoring, page 3-4, and Section 5.2, Long-Term Pilot Test Operational Parameters, page 5-1

Permittee Statement: "A 15-ft radius from the injection well was assumed for the calculation of each test cell control volume. The thickness of each test cell control volume was the filter pack length, plus 5 ft above and below to account for vertical air flow. The injection rate was calculated based on the addition of four pore volumes of the test cell in each well."
and,
"The remediation area for the long-term bioventing test is defined as a control radius of 70 ft (the farthest distance between injection wells and observation wells) along with the filter pack thickness of the injection well to obtain a volume of impacted soil."

NMED Comment: The estimated test cell volume was significantly increased for the long-term pilot test. In the revised Report, provide a table presenting (1) soil types at the screened intervals of injection and monitoring wells, (2) all input values (e.g., thickness, control radius, porosity) for the short- and long-term pilot tests, (3) calculated pore volumes based on the input values, (4) target volumes of air to be injected, and (5) actual volumes of air injected.

14. Section 3.4.1.1, [Dry Respirometry Testing] Air Injection and Pressure Monitoring, page 3-3

Permittee Statement: "Air injection flow rates and well head pressures were recorded daily and are presented in Tables 3-13 through 3-15. During air injection, well head pressures were monitored in wells KAFB-106V1 and KAFB-106V2 and are presented in Tables 3-16 and 3-17."

NMED Comment: Tables 3-13 through 3-17 provide data collected during air injection for the dry (April 22 – 28) and wet (June 20 – 26) respiration tests. Although respiration monitoring was conducted for the dry (April 28 – May 9) and wet (June 26 – July 5) respiration tests without air injection, these tables do not indicate that subsequent monitoring was conducted. Section 3.4, *Respirometry Field Testing,* states that the dry and wet respiration pilot tests were conducted between April 22 and May 9, 2019 and between June 20 and July 5, 2019, respectively. However, since the timeline of the events was not clearly described in the Report, the tables may be perceived as incomplete and cause confusion among readers. In the revised Report, provide a table presenting timeline for the short- and long-term pilot tests including dates for (1) baseline data collection, (2) air injection periods, and (3) post-injection respiration monitoring periods.

15. Section 3.4.1.2, Dry Respirometry, page 3-3

Permittee Statement: "Oxygen concentration within the subsurface was plotted against time for each well location and a linear regression was applied to determine the oxygen utilization rate."

NMED Comment: The plots were included in Appendix D, *Oxygen Utilization Plots.* However, it is more appropriate to include these plots in the Report, rather than the appendix because the slope of linear regression is interpreted as an oxygen utilization rate, which is the key parameter to estimate the biodegradation rate and long-term bioventing flow rate. Please include the plots in the figures section of the revised Report.

16. Section 3.4.2, Water Injection, page 3-3

Permittee Statement: "Prior to injection, the water was field tested for residual chlorine in order to reduce the possibility that chlorinated water could inhibit microbial growth in the subsurface."

NMED Comment: Explain what kind of field test was conducted to determine residual chlorine level in the water. If field notes that record testing procedures and results are available, include them in the revised Report.

17. Section 4.1, Respiration Data Analysis, page 4-1

Permittee Statement: "If the oxygen and carbon dioxide readings were at atmospheric conditions of 20.9 and 0.0%, respectively, then the field readings were accepted as correct."

NMED Comment: The statement indicates that the instrument is unable to detect changes in oxygen and carbon dioxide levels less than one thousand parts per million. The instrument may be adequate to monitor overall changes in oxygen and carbon dioxide concentrations in subsurface after air injection, but it is not clear whether such instrument is suitable for quantification of microbial activity. Please explain why the instrument is appropriate for the pilot tests in the revised Report.

18. Section 4.1, Respiration Data Analysis, page 4-1

Permittee Statement: "While variability of oxygen/carbon dioxide was observed in many of the wells during the respiration testing, the changes were more prevalent within the SVEWs, possibly due to the longer screen intervals that would be more greatly affected by barometric pressure changes."

NMED Comment: Discuss the correlation between barometric pressure, subsurface oxygen/carbon dioxide levels and screen length in the revised Report. Additionally, provide example data to support the discussion.

19. Section 4.1, Respiration Data Analysis, page 4-1

Permittee Statement: "However, oxygen concentrations overall consistently declined during the respiration testing providing clear evidence of oxygen demand and hydrocarbon biodegradation."

NMED Comment: The decrease in oxygen levels and increase in carbon dioxide levels in injection wells may also be attributed to diffusion of soil gas, dilution of injected air, and desorption/volatilization of organic compounds. Influx of soil gas and efflux of air may be the primary causes of an increase in carbon dioxide and a decrease in oxygen concentrations. Revise the statement for accuracy in the revised Report.

20. Section 4.1, Respiration Data Analysis, page 4-1

Permittee Statement: "A safety factor of 4 times the calculated oxygen utilization rate is being supplied to ensure oxygen is being delivered at a rate much greater than it is being utilized."

NMED Comment: If multiple pore volumes of air were applied to the test cell, air flow would have extended beyond the test cell boundary likely through the same flow paths originally created by initial application of air (e.g., fractures). Injection of multiple pore volumes of air may dilute soil gas within the test cell and push soil gas beyond the test cell boundary. However, excess air may not necessarily increase the microbial oxygen utilization rate. A large volume of the injected air may move contamination round in the subsurface. Revise the statement to acknowledge this possibility.

21. Section 4.1, Respiration Data Analysis, page 4-1

Permittee Statement: "As can be seen in the data, substantially lower relative humidity was measured during the wet respiration testing than the dry. It appears this is an artifact of timing; ambient air temperatures were warmer during the wet test. Measurement instability occurs when a soil vapor sample is extracted above ground and run though the instrument. On warm days, the sample temperature increases to near ambient, which decreases relative humidity. As the ambient temperature fluctuates, so does the relative humidity."

NMED Comment: The method used to measure relative humidity is not appropriate. The relative humidity data must not be affected by fluctuations of the ambient temperature. Subsurface temperature is likely more stable than that of the ambient air; the measurements should have been conducted to minimize the influence of changes in ambient temperatures. Please evaluate alternative methods for relative humidity measurement and provide a discussion in the revised Report.

Since the relative humidity was higher during the dry respiration test compared to the wet respiration test, the relatively humidity data does not make sense. The relative humidity data must be converted to absolute humidity values and its acceptability for use evaluated. If the converted data makes sense, revise all applicable tables to present absolute humidity, rather than relative humidity. Otherwise, remove all data and discussions regarding relative humidity from the revised Report.

22. Section 4.1, Respiration Data Analysis, pages 4-1 and 4-2

Permittee Statement: "In some of the locations, the absolute humidity appears marginally higher in the wet test; however, the reasons for this are unclear. The water injected into the wells for the wet test was likely warmer than the soils resulting in warmer soil immediately surrounding the sampling point screens. This could account for the absolute humidity differences."

NMED Comment: Since water was injected prior to the wet respiration test, the higher absolute humidity readings during the wet respiration pilot test make sense; however, the readings were only marginally higher than those observed during the dry respiration test. This observation suggests that the method used to distribute moisture (pressurized water injection) was not effective. The moisture addition method must be evaluated during the long-term pilot test. During the evaluation, other moisture distribution methods (e.g., cool mist injection) must be evaluated.

Additionally, soil vapor temperatures were generally higher than ambient air temperatures according to Tables 3-2 through 3-10. The water temperature is lower than, or equivalent to, the ambient air temperature. It may be more reasonable to assume that soil temperature was higher than that of the water which would make the Permittee's statement incorrect. Revise the statement accordingly.

23. Section 4.2.1, Oxygen Utilization Rate, page 4-2

Permittee Statement: "Oxygen utilization rates for the dry respiration testing varied between 0.163 and 0.475% per day for the SVMWs and between 0.497 and 0.639% per day for the SVEWs (Appendix D-1 and Table 4-1). The oxygen utilization rate averaged 0.340% per day for the SVMWs while averaging 0.563% per day for the SVEWs. The overall average oxygen utilization rate for the dry respiration test was 0.414% per day."

NMED Comment: According to Appendix D-1, *Oxygen Utilization,* the daily oxygen concentrations are plotted for each injection well. Each slope of the curve is reported as "oxygen utilization rate". However, the reduction in oxygen levels may be attributed to dilution of injected air and is not necessarily limited to oxygen utilized for hydrocarbon biodegradation (see Comment 19).

Additionally, elevated hydrocarbon concentrations (e.g., 250 parts per million benzene) reportedly inhibit aerobic biodegradation. The level of hydrocarbons at the site is high enough to affect the results. In order for aerobic biodegradation to be induced at the site, the concentrations may initially need to be diluted with air. The observed reduction in oxygen levels must not be assumed to be the result of microbial activity. The referenced oxygen utilization rate is more appropriately referred to as "oxygen reduction rate". Please revise the Report for accuracy.

24. Section 4.2.2, Biodegradation Rate, page 4-2

Permittee Statement: "Biodegradation rates during the dry respiration testing ranged between 0.096 and 0.281 milligrams per kilogram per day (mg/kg/day) for the SVMWs and between 0.294 and 0.378 mg/kg/day for the SVEWs (Table 4-1). Biodegradation rates during the wet respiration testing ranged between 0.081 and 0.308 mg/kg/day for the SVMWs and between 0.012 and 0.371 mg/kg/day for the SVEWs."

NMED Comment: According to Appendix E-1, *Calculation of Biodegradation Rate, Oxygen Demand Flowrate, and Oxygen Radius of Influence*, the biodegradation rates were calculated as a function of oxygen utilization rates. However, the observed oxygen reduction is not entirely accounted for by microbial oxygen utilization (see Comments 19 and 23). Therefore, the biodegradation rates must not be calculated from the observed oxygen reduction rates. Remove the discussion from the revised Report.

25. Section 4.2.3, Oxygen Demand Air Flow Rate, page 4-3

Permittee Statement: "The oxygen demand flow rate represents the minimum ambient air injection flow rate required to maintain the biodegradation rates obtained in the respirometry calculations. The oxygen demand air flow rate was calculated based on the oxygen utilization rate and corresponding biodegradation rates for each well under both the dry and wet respiration conditions (Appendix E-1)."

NMED Comment: The oxygen demand flow rates were calculated as a function of oxygen utilization rates. The calculated flow rates do not represent the minimum air flow rates required to maintain biodegradation rates. However, the minimum air injection flow rates required to compensate the loss of oxygen can be calculated from the observed oxygen reduction rates. Modify the formula provided in Section 3.1.6 of the *Work Plan for Bioventing and Air-Lift Enhanced Bioremediation Pilot Tests* (Work Plan), dated November 2017, and calculate the required air injection flow rates. Revise the Report accordingly.

26. Section 4.2.4, Intrinsic Permeability, page 4-3

Permittee Statement: "Intrinsic permeability was calculated for the SVEWs under both the dry and wet respiration conditions (Table 4-1). The calculations are provided in Appendix E-2."

NMED Comment: According to Appendix E-2, *Intrinsic Permeability Calculations*, intrinsic permeability was calculated based on well vacuum. A positive pressure was applied to the wells as air was injected from the wells; however, the formula used to calculate intrinsic permeability required vacuum (negative) pressure. Please provide an explanation for the discrepancy in the revised Report.

In addition, the radii of influence (ROIs) used to calculate intrinsic permeability were different from the ROIs reported in Table 4-1. For example, the ROI used to calculate intrinsic permeability was 113 feet for well SVEW-01-260 during the dry respiration test according to Appendix E-2-1. However, the ROI reported in Table 4-1 was 143 feet for the same well. Correct, or provide an explanation for, the discrepancy in the revised Report.

27. Section 4.2.4, Intrinsic Permeability, page 4-3

Permittee Statement: "Intrinsic permeability was not calculated for the SVMWs as the large amount of head loss that occurred in the 0.5-inch diameter wells did not allow for accurate pressure monitoring at the injection point."

NMED Comment: Section 3.2 indicates that the issue associated with head loss was resolved by replacing the 1.5-horsepower regenerative blower with two 1-horsepower rotary vane pumps. Please provide further clarification of the issue and resolution in the revised Report. In addition, the well head pressure readings during and after air injection for SVMWs are reported in Tables 3-13, 3-14 and 3-2 through 3-7, respectively. This data should not be included in the Report or it must be qualified to account for the inaccurate pressure readings for SVMWs in the revised Report.

28. Section 4.2.5, Radius of Influence, page 4-3

Permittee Statement: "[T]he oxygen ROI was calculated using the oxygen utilization rates and long-term bioventing operation flow rates as described in the Work Plan (Kirtland AFB, 2017a)... The oxygen ROI varied between 138 and 143 ft for the dry respiration test and between 138 and 152 ft for the wet respiration test."

NMED Comment: The ROI was calculated based on oxygen utilization rates. However, the observed oxygen reduction is not entirely accounted for by microbial oxygen utilization. Therefore, the method used to estimate the ROI is not appropriate. Use pressure response data to estimate the ROIs, where applicable, or if appropriate, modify the formula provided in Section 3.1.8 of the November 2017 Work Plan, and calculate the ROIs. Revise the Report accordingly.

29. Section 4.2.6, Soil Vapor Analytical Results, page 4-3

Permittee Statement: "Soil vapor analytical data and the analytical laboratory reports are provided in Appendix B-2. TPH-GRO, BTEX, and EDB concentrations were collected and are provided in Table 3-12."

NMED Comment: According to Appendix B-2, *Soil Vapor Analytical Results,* EDB was only analyzed with EPA Method TO-15. The Permittee's April 3, 2017 letter states, "[Method]

CARB 422 may be used for individual tasks where it is important to evaluate EDB in soil vapor in the presence of high concentrations of HC in relation to EDB concentrations, such as monitoring the effectiveness of bioventing or air-lifting interim measures in the source area. In these instances, CARB 422 will be included where appropriate in the individual work plan for that task." Since hydrocarbon molecules do not interfere with the measurement of EDB by Method CARB 422, lower limits of quantitation (LOQ) are achievable with the method, allowing for more accurate detection of EDB in soil vapor than with Method TO-15. Elevated hydrocarbon concentrations were observed in soil vapor samples at the site; therefore, it is appropriate to analyze EDB samples using both Methods CARB 422 and TO-15. Include this provision during the long-term pilot test.

30. Section 4.2.6.1, [Soil Vapor Analytical Results] Baseline Respiration Sampling, page 4-4

Permittee Statement: "The sum of BTEX ranged from 2,400,000 to 9,130,000 $\mu g/m^3$."

NMED Comment: Although Table 3-12, *Summary of Hydrocarbon Analytical Results,* records concentrations of benzene (B), toluene (T), ethylbenzene (E), and total xylenes (X) separately, the sum of these constituents is not recorded in the table. Revise the table to include the sum of BTEX.

31. Section 4.2.6.2, [Soil Vapor Analytical Results] Post-Dry Respiration Sampling, page 4-4

Permittee Statement: "TPH-GRO ranged from 52,000,000 to 210,000,000 $\mu g/m^3$."

NMED Comment: Out of 12 monitoring points, the TPH-GRO concentrations after the air injection were recorded as higher in six locations, the same in three locations, and lower in two locations compared to the baseline concentrations. Longer-term monitoring is necessary to evaluate the effectiveness of the pilot test because the results of the short-term pilot test indicate that the bioventing technology is not effective. Please provide a submission schedule for the required status reports in the revised Report (see Comment 4).

32. Section 4.2.6.3, [Soil Vapor Analytical Results] Post-Wet Respiration Sampling, page 4-4

Permittee Statement: "Data collected during the respiration tests will be used as baseline data to assess the biodegradation throughout the full-scale bioventing test."

NMED Comment: Currently, full-scale bioventing as a means to remediate vadose zone hydrocarbons is not recommended based on the analytical results of the short-term pilot tests. However, longer-term monitoring will be necessary to fully evaluate the effectiveness of the bioventing system for hydrocarbon removal from the vadose zone (see Comment 31).

33. Table 3-18, Bioventing Respiration Pilot Test Water Injection Summary

NMED Comment: The September 2018 Procedure states that the water volume for the wet respiration test was designed to be 1% of the pore volume. However, it is not clear whether the design protocol was followed during water injection. For example, the length of screened intervals for wells SVMW-11-250 and SVMW-11-260 was identical at 2.5 feet; however, water injection volumes for these wells were 325 and 625 gallons, respectively, according to Table 3-18. In Table 3-14, *Bioventing Respiration Pilot Test Air Injection Summary – SVMW-11,* the pore volumes were estimated as 4,278 and 8,036 cubic feet, respectively. It is not clear how the volumes were so different even though the length of screened intervals was identical. Provide an explanation for the difference in the estimated pore volumes among the test cells in the revised Report.

34. Tables 4-2 through 4-13, Respiration Monitoring

NMED Comment: According to the tables, after the long-term bioventing pilot test was initiated, the oxygen levels in all monitoring locations increased and reached a plateau in less than one month. Since hydrocarbons are still abundant in all monitoring locations, microbes could have utilized oxygen to degrade hydrocarbons and produce carbon dioxide and water. However, the carbon dioxide concentrations decreased as oxygen concentrations increased. Similarly, relative humidity readings were lower than those of the baseline in most locations. The carbon dioxide and water production were not obvious at any location. It appears that air is diluting soil gas at the monitoring locations but is not utilized for biodegradation. It is possible that the high level of hydrocarbons may hinder microbial activity. Discuss the kinetics of aerobic biodegradation in comparison to the rate of dilution in the revised Report. Additionally, please propose additional analytical methods to verify biodegradation (e.g., isotope analysis) and evaluate the applicability of such methods during the long-term pilot test (see Comment 3).

NEW MEXICO
ENVIRONMENT DEPARTMENT

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 25, 2020

Colonel David S. Miller
Base Commander
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117

Lt. Colonel Wayne J. Acosta
Civil Engineer Office
377 Civil Engineer Division
2050 Wyoming Blvd SE, Suite 116
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RE: APPROVAL WITH MODIFICATIONS
PHASE I RCRA FACILITY INVESTIGATION REPORT
BULK FUELS FACILITY SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO
EPA ID# NM6213820974
HWB-KAFB-18-009

Dear Colonel Miller and Lt. Colonel Acosta:

The New Mexico Environment Department (NMED) is in receipt of the Kirtland Air Force Base (Permittee) *Phase I RCRA Facility Investigation Report, Bulk Fuels Facility, Solid Waste Management Unit ST-106 and SS-111, August 2018* (Report), received August 30, 2018. NMED has reviewed the Report and hereby issues this Approval with Modifications. NMED's comments are attached to this letter.

The Report is approved with modifications to allow the Permittee to focus resources on completing investigation activities at the Kirtland Airforce Base (KAFB) Bulk Fuels Facility Spill (BFFS) site in order to acquire sufficient data to select a final remedy for the BFFS site. However, NMED is aware that additional site investigations have been performed at the Site since 2016 which have provided additional information and that further site investigations are currently in the planning stages which should lead to a more comprehensive conceptual site model (CSM). Therefore, the CSM presented in this Phase I RFI Report is not approved. A comprehensive CSM must be included in the Phase II RFI report to be submitted to NMED at the conclusion of investigation activities at the site.

This Approval with Modifications does not require any revisions to the Report. The attached comments discuss limitations regarding use of the information provided in the Report. General topics and several examples of NMED's comments were discussed during a NMED/KAFB conference call on August 27, 2020.

This Approval with Modifications is based on the information presented in the document as it relates to the objectives of the work identified by NMED at the time of review. Approval of this document does not constitute agreement with all information, or every statement presented in the document.

The Permittee must submit a work plan for a Phase II RCRA Facility Investigation Report to NMED for review no later than **April 30, 2021**.

Should you have any questions please contact me at (505) 476-6035.

Sincerely,

Kevin Pierard

Digitally signed by Kevin Pierard
Date: 2020.09.25 14:37:49 -06'00'

Kevin Pierard, Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
L. Andress, NMED HWB
L. King EPA Region 6 (6LCRRC)
S. Kottkamp, KAFB
K. Lynnes, KAFB
C. Cash, KAFB

File: KAFB 2020 Bulk Fuels Facility Spill and Reading

Attachment

Kirtland Air Force Base (KAFB) Bulk Fuels Facility
Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation Report History

The history of this document involves draft documents and meetings; therefore, a brief background is presented below.

Correspondence History:

Date	Action	Abbreviation
1/20/17	KAFB Submitted Phase I RCRA Facility Investigation Report	2017 RFI
8/3/17	NMED sent preliminary review letter to KAFB	
11/16/17	NMED sent Notice of Disapproval (NOD)	2017 NOD
1/19/18	Draft Second NOD prepared by NMED	2018 NOD
1/31/18	Meeting between NMED and KAFB resulting in the submittal of KAFB's Response to Comments (RTC) matrix regarding 2018 Draft NOD	RTC
8/30/18	KAFB Submitted a revised Phase I RCRA Facility Investigation Report	2018 RFI

In summary, NMED issued a Draft Notice of Disapproval letter dated January 19, 2018 in response to the Permittees Resource Conservation and Recovery Act (RCRA) Phase I Facility Investigation (RFI) Report dated January 2017. The Permittee and NMED met on January 31, 2018 to discuss these NOD comments. The RTC generated as a result of this meeting states that the Permittee agreed to make specific revisions to the Phase I RFI, which was submitted to NMED as the Phase I RFI Report (Report) on August 2018. This Approval with Modifications pertains to the Report submitted to NMED on August 30, 2018.

The comments below are organized into three sections:

1. Comments made in NMEDs 2018 Draft second NOD including KAFB's 2018 RTC are indented, followed by the current NMED 2020 comment, which is not indented.
2. General Comments on the August 2018 Phase I RFI Report, comments are not indented.
3. Specific Comments on the August 2018 Phase I RFI Report, comments are not Indented.

MODIFICATION COMMENTS:

2018 NOD COMMENTS

1. **2018 NOD Comment 43:** Response required in the Phase II RFI Report.

    Permittee's Statement in 2017 RFI Report, p. 4-27, 5th paragraph: "In 2014, based on exceedances of the 2012 NMED residential soil screening levels (SSLs) detected in samples from the former pipeline investigation, approximately 2,340 cy (3,648 tons) of soil was removed and transported off-site for disposal at Valencia Regional Landfill in Los Lunas, NM…"

NMED 2018 Comment: "The Permittee shall update the text to include soil concentrations."

Permittee 2018 RTC Response: "Concur."

NMED 2020 Comment: This comment was not fully addressed in the response to the 2018 NOD. The revised text includes a bulleted list of some soil concentrations and states "Appendix B includes all analytical data from the original source area investigation and excavation confirmation samples collected." Appendix B contains three tables, one of which is a 5,684-page PDF table in which data is not presented chronologically and cannot be sorted by date. The data for the 2012 and 2014 former pipeline investigation soil samples cannot be located in Appendix B. The Permittee must clearly present all analytical data from the former pipeline investigations in a searchable format in the Phase II RFI report to allow for these data to be evaluated for decision-making purposes.

2. **2018 NOD Comments 45, 46, 47, and 48:** No response required.

NMED 2018 Comment 45: "The equation for calculating the mass of hydrocarbon (HC) extracted is not dimensionally correct as provided. The Permittee shall revise the text and calculations to use the correct equation and show the units for the conversion factor of 24.055."

NMED 2018 Comment 46: "The operating times are not provided in the RFI Report and the flowrate and hydrocarbon content are provided in a format that does not lend itself to being useful for checking the calculations. The Permittee must revise the RFI Report to include a summary table such as Table 3-5 in the April -July 2015 quarterly monitoring report. NMED is unable to verify the accuracy of the calculations in the report without the missing information."

NMED 2018 Comment 47: "The equation for calculating the mass of HC biodegraded is not dimensionally correct as provided. The Permittee must verify the equation being used and recomplete the calculations present. The Permittee must revise the text to define variable "D" and indicate the units. Additionally, the Permittee must include the value of C_{Vbkgd} used in the calculation."

NMED 2018 Comment 48: "The Permittee points the reader to Appendix L for a summary of biodegradation calculations and the cover sheet for Appendix L-1 states that the calculations are provided. However, the appendix only contains the results and not the actual calculations. Consequently, NMED cannot verify the accuracy of the calculations. The Permittee must revise the RFI Report to include the calculations so that NMED can verify the results presented."

Permittee 2018 RTC Response to Comments 45, 46, 47, and 48: "Not all requested inputs are provided in the original reports. Some of the information is available, however the SVE operation goes back to 2003. Individual inputs for the soil vapor monitoring locations are not available."

NMED 2018 Response: "Agrees that we are limited with what was provided by previous sub-contractors."

2018 Decision: "Remove the sections talking about the calculations, but refer to the actual report, and state that the calculations cannot be reproduced, and state as such. Concur with solution."

NMED 2020 Comment: Section 4.6.2.5 [soil vapor extraction] SVE HC Mass Removal, of the Report does not contain the requested information regarding the equations, defining variables, units, and inputs used to make these calculations, nor was the reason for omitting this information included in the Report. Furthermore, Appendix L-1 (Mass Extraction Calculations) from the 2017 Phase I RFI was removed from the 2018 Report rather than being updated to contain the information specified in NMED 2018 Draft NOD Comments 45, 46, 47, and 48. Therefore, hydrocarbon removal estimates prior to 2016 as a result of the CATOX operations or biodegradation cannot be used for decision-making purposes at the site unless the data is re-presented along with the necessary supporting information.

3. **2018 NOD General Comment 3:** No response required.

NMED 2018 Comment: "The RFI Report discusses vapor testing in soil and on-base industrial buildings, including the issue of vapor intrusion into industrial buildings. The Permittee's discussion of the potential for groundwater contaminant diffusion and vapor transport, as it pertains to the potential for vapor intrusion both on-base and off-base, is piecemeal and does not compare off-base soil vapor and groundwater data with NMED risk-based screening levels. The Permittee shall provide a rigorous analysis of the potential for soil vapor contamination to migrate into homes and buildings located off-base and the findings integrated into the Conceptual Site Model presented in the RFI Report"

Permittee 2018 RTC Response: "Any discussion related to vapor intrusion risk will be removed from the RFI Report. The report will point to the Risk Assessment, take out all reference to potential for vapor intrusion. Keep soil vapor data, tables, discussion "just stick to the data only."

NMED 2020 Comment: Since the discussion of the soil vapor intrusion data was deleted from the Report, should the Permittee wish to use the pre-2016 soil vapor data for decision-making purposes, this data must be presented in the Phase II RFI report. All soil vapor data included in the Phase II RFI Report must be screened against the NMED vapor intrusion screening levels (VISLs) in effect at the conclusion of all related investigation activities at the site.

4. **2018 NOD Comment 37:** Response required in the Phase II RFI.

    NMED 2018 Comment: "Section 4.4.1: The Permittee does not discuss soil vapor detections off base and compare those detections to NMED VISLs, as outlined in the NMED screening guidance published March 2017. The Permittee shall revise the RFI Report to incorporate NMED VISLs."

    Permittee 2018 RTC Response: "VISLs are used in the Risk Assessment. Defer to Risk Assessment by stating just the data and then refer to the Risk Assessment."

NMED 2020 Comment: The Permittee must discuss soil vapor intrusion detections off base and compare those detections to NMED VISLs in effect at the conclusion of investigation activities at the site in the Phase II RFI.

5. **2018 NOD Comment 24:** No response required.

    NMED 2018 Comment: "The Permittee shall add a bullet to state that additional information is required on locations of ethylene dibromide (EDB) partitioning out of the [light non-aqueous phase liquid] LNAPL and the rate(s) of partitioning under varying redox conditions. Additionally, a bullet is required to address the need for revising and updating the [compound specific isotope analysis] CSIA that was conducted at the site to obtain a more meaningful and robust analysis of residual and degraded fractions of EDB. The CSIA included in the RFI Report is not technically defensible due to coelution of benzene and other organic compounds with EDB, not using two-dimensional gas chromatography as the preferred analytical method, EDB concentrations at detection limits of analytical instruments, and lack of fresh LNAPL samples for carbon isotope analysis on EDB."

    Permittee 2018 RTC Response: "Include map of locations where benzene exceeds effective solubility…"

NMED 2020 Comment: Figure 5-1, Wells with Historical LNAPL Detections, depicts wells that have exceeded the effective solubility for benzene, but does not state when these wells were sampled. This figure does not clearly illustrate the exceedance of effective solubility for benzene or EDB, nor does it illustrate the inference of submerged LNAPL. In addition, the CSIA used likely underestimated EDB concentrations, this is further discussed in Specific Comment 15 below.

6. **2018 NOD Comment 28.d:** No response required.

    NMED 2018Comment: "Figure ES-9: The Permittee shall revise the figure to fix the typographical error and correct "Dissolve Magnesium" to "Dissolved Manganese."

    Permittee 2018 RTC Response: "Concur."

    NMED 2020 Comment: The figure was not corrected. The Permittee must ensure that all figure titles are correct in the Phase II RFI report.

7. **2018 NOD Comment 38:** No response required.

    NMED 2018 Comment: "The 2005 temporary [soil vapor monitoring] SVM results are not included in Appendix G. Additionally, the locations of and boring logs for SB-01 through SB-09 are not provided in the RFI Report. The Permittee must revise the RFI Report to include this missing data. If the data is not available to be included, the statement should be revised to clarify the data available and included in the report."

    Permittee 2018 RTC Response: "Concur."

    NMED 2020 Comment: The table of historical soil vapor analytical results provided as a PDF in Appendix G is 7,357 pages long and does not appear to include data from 2005. The Permittee must not rely on this data for future decision-making purposes.

8. **2018 NOD Comment 49:** No response required.

    NMED 2018 Comment: "Many of the figures in Section 4.0 rely on color to differentiate wells, borings, and sampling locations or data. Thus, these figures are essentially meaningless to the roughly 7 percent of the population who have color vision deficiency. NMED requests that the Permittee revise the figures to be able to be interpreted by all readers, including those with color vision deficiency."

    Permittee 2018 RTC Response: "Can alter a few specific maps, but will be concise moving forward with symbols. Mainly the section 4 figures…"

    NMED 2020 Comment: No figures were revised in the Report. The Permittee must ensure that all figures in the Phase II RFI report are able to be interpreted by all readers, including those with color vision deficiency.

9. 2018 NOD Comment 54: No response required.

> **NMED 2018 Comment:** "Asked for clarification regarding use of the term bioslurping regarding Permittee's Statement on p. 5-2, 5th paragraph: "These systems did not have a small diameter drop pipe but were still able to volatilize LNAPL off of the water table as these SVE locations are screened in both the saturated and unsaturated zone, thus performing a bioslurping function."
>
> **Permittee 2018 RTC Response:** "Concur."

NMED 2020 Comment: The language was changed slightly as "bioslurping function" was changed to "LNAPL recovery", however both LNAPL and soil vapor are recovered in modified bioslurping activities. The Permittee must clarify whether water, LNAPL, and / or soil vapor were recovered with modified bioslurping methods when discussing this method.

10. 2018 NOD Comment 87: Response required in the Phase II RFI Report.

> **NMED 2018 Comment:** "…floating LNAPL has been detected in a water table groundwater monitoring well at the In-Situ Bioremediation (ISB) Pilot Test, indicating that the Permittee's assertion of no floating LNAPL inside monitoring wells is incorrect. The Permittee must revise this conclusion."
>
> **Permittee 2018 RTC Response:** "Concur – Will make correction."

NMED 2020 Comment: While the main issue of this comment was addressed appropriately, the Permittee did not revise the text to include the presence of LNAPL in ISB wells. This is critical information for understanding the nature and extent of contamination at the site. This information must be included in the Phase II RFI report.

11. 2018 NOD Comment 35: Response required in the Phase II RFI Report.

> **NMED 2018 Comment:** "During an evaluation of soil vapor monitoring points ("SVMPs"), sampling processes, and development of the soil vapor rebound and biorespiration testing, the Permittee noted that many SVMPs did not have air tight seals. The Permittee must revise the RFI Report to include a discussion on the lack of SVMP seals and potential impacts on soil vapor concentration data as well as on estimates of soil vapor contaminant degradation."
>
> **Permittee 2018 RTC Response:** "Concur."

NMED 2020 Comment: The Permittee removed all text related to air tight seals from the

Report. For these data to be used for decision-making purposes at the site, a discussion regarding the lack of SVMP seals and the potential impacts on soil vapor concentration data and estimates of soil vapor contaminant degradation must be included in the Phase II RFI report.

12. 2018 NOD Comment 92: No response required.

NMED 2018 Comment: "Appendix L-1, [Mass Extraction Calculations]: The results are in units of volume (gallons) and not mass (pounds) as indicated by the sub-appendix title."

Permittee 2018 RTC Response: "Concur."

NMED 2020 Comment: The Permittee removed Appendix L-1 in its entirety; therefore, all data and conclusions related to information dependent upon mass extraction calculations may not be used for decision-making purposes at the site.

13. 2018 NOD Comment 94: No response required.

NMED 2018 Comment: "Appendix R, Quant-Array^{TM}-Chlor and Reduced Gases (Hydrogen/Methane/Ethene/Ethane) Study: Please see Attachment B for NMED's technical memorandum on the errors, comments, and revisions required for Appendix Q."

Permittee 2018 RTC Response: "Concur. [waiting for further comments from NMED, to see if will remove or not.]"

NMED 2020 Comment: The Permittee removed Appendix R in its entirety, therefore all data and conclusions related to the information contained in the Quant-Array^{TM}-Chlor and Reduced Gases (Hydrogen/Methane/Ethene/Ethane) Study may not be used for decision-making purposes at the site.

14. 2018 NOD Comment 95: No response required.

NMED 2018 Comment: "Appendix T, Trend Analysis of EDB and Benzene in Groundwater at Kirtland Air Force Base, [fourth quarter] Q4 2015: Please see Attachment C for NMED technical memorandum on errors, comments, and revisions required for Appendix T."

Permittee 2018 RTC Response: "Concur. Will discuss further."

NMED 2020 Comment: The Permittee removed Appendix T in its entirety; therefore, all data and conclusions related to trend analysis of EDB and benzene in groundwater at the site prior to 2016 may not be used for decision-making purposes.

SPECIFIC 2020 COMMENTS ON THE 2018 REPORT:

15. Section 6.2.1.2, Compound Specific Isotope and Microbial Analyses Sampling, page 6-6, line 28; Response required in the Phase II RFI Report.

Permittee Statement: "CSIA and biological parameter samples were collected at 31 wells in [third quarter] Q3 2013. Quality issues were identified with these 2013 data in an EPA review (EPA, 2014). Consequently, the 2013 CSIA data were not used in this Report."

NMED Comment: A discussion of the data quality issues regarding CSIA performed at the site (i.e., samples were not analyzed using two-dimensional gas chromatography), the potential of the underestimation of EDB concentrations, the affected data, and what was done to correct the issue must be included in the Phase II RFI report or the data cannot be used for decision-making purposes.

16. Section 7.7, Current and Future Land Use, page 7-7, line 40; Response required in the Phase II RFI Report.

Permittee Statement: "Kirtland [Air Force Base] AFB is an active military installation and is expected to remain active for the foreseeable future. Kirtland AFB is adjacent to the Albuquerque International Sunport and is bounded to the north and west by the city of Albuquerque (residential areas), to the south by the Pueblo of Isleta, and to the east by the Cibola National Forest."

NMED Comment: The property to the north Kirtland AFB, and over the off-base EDB plume is a mixed-use area containing recreational (Bullhead Park), residential, and commercial properties. The Phase II RFI Report must discuss all land use over the groundwater contaminant plumes (i.e., recreational and commercial).

17. Section 2.2, Initial Discovery of Leaked Fuel and Subsequent Investigations, page 2-4, line 2; Response required in the Phase II RFI Report.

Permittee Statement: "Site specific measurements of LNAPL in the soil and soil vapor were entered into Rockworks and ArcGIS, and apparent LNAPL thicknesses in the saturated zone were entered into the software program OILVOL."

and

"The software also used vadose zone soil and vapor concentrations interpolated across the affected vadose zone soil and pore space to estimate total LNAPL mass."

NMED Comment: The software developers of OILVOL claim that the purpose of the model is to provide a volume of mobile LNAPL and it is not recommended for accurately estimating the volume of residual LNAPL in the saturated and unsaturated zone. Disclose that, according to the developer of OILVOL, there is significant uncertainty in using this software to estimate LNAPL mass and provide justification for using it to estimate total LNAPL mass at the site. The Permittee must also state the margin of error that exists in these calculations when using OILVOL.

18. Section 2.2, Initial Discovery of Leaked Fuel and Subsequent Investigations, page 2-4, line 9; No response required.

Permittee Statement: "The LNAPL mass in the vadose zone soils and vapors was converted to liquid equivalent according to jet fuel composition. The calculations estimated that approximately 48,000 gallons of LNAPL were present in soil vapor, approximately 630,000 gallons of LNAPL were present in soil pores in the vadose zone, and 5.2 million gallons of immiscible LNAPL was present for a total estimated volume of 5.9 million gallons in the subsurface."

NMED Comment: Supporting information was not referenced in this statement and the Air Force does not know the volumes of the fuel types released over decades. Calculations and conversion factors were not presented in the text of the report or its appendices. The Permittee must not use these data for decision-making purposes.

19. Section 6.3.3, Groundwater-Level Monitoring Results; Response required in the Phase II RFI Report.

Permittee Statement: "The initial depth to water at production well KAFB-3 was 407 feet measured in 1949. This well is screened from a depth of 448 feet to 900 feet bgs. The greatest depth to water measured at this well was 550 feet in 2009. Water levels were collected when KAFB-3 was not pumping, which was during the original installation and subsequent pump repair events."

NMED Comment: The Permittee's statement indicates that KAFB-3 is a production well; however, the well is not mentioned elsewhere in the Report where the other drinking water supply wells are discussed. The Phase II RFI must provide additional detail for this well including the purpose of the water supplied from this well, whether it is currently in use, and, if not in use, KAFB's future plans for this well. If the well is currently in use, the well must be included in the groundwater monitoring program at the site and the results included in the Phase II RFI report.

20. Section 7.8, Current and Future Water Use; page 7-8, line 6; Response required in the

Phase II RFI Report.

Permittee Statement: "Near the Site, the aquifer supplies drinking water to the city of Albuquerque, the Raymond G. Murphy VA Medical Center, and Kirtland AFB, along with suppling private irrigation wells."

NMED Comment: The Permittee must provide tabulated data of the screened intervals for all private and production wells near the site. This information is important for the corrective measures evaluation as well as future risk management decisions.

21. Section 4.6.2, SVE Systems, page 4-27, line 15; No response required.

Permittee Statement: "Based on operational hours, flow rates, and influent soil vapor [oxygen] O2 concentrations, it is estimated that approximately 209,000 gallons of fuel have biodegraded within the area influenced by SVE operation."

NMED Comment: NMED required the Permittee to provide the calculations to support the estimate in the 2018 Draft Second NOD. Supporting information was not provided for verification of volume of fuel biodegraded that was presented in the Report.

22. Section 6.3.2.6, Compound-Specific Isotope and Microbial Analysis Results, page 6-25, line 25; No response required.

Permittee Statement: "The microbial and reduced gas analyses provided evidence that microbial mediated reductive debromination of EDB is occurring in situ in the BFF plume. Conditions throughout much of the EDB-impacted area were anaerobic and electron donors and acceptors facilitating reductive debromination were present."

NMED Comment: Supporting material was not provided in the Report to verify the statement regarding biodegradation or its effectiveness in reducing EDB concentrations throughout the contaminant plume.

23. Section 6.3.2.6, Compound-Specific Isotope and Microbial Analysis Results, page 6-25, lines 20 and 23; Response required in the Phase II RFI Report.

Permittee Statements: "The lowest EDB δ13C ratios were in the benzene plume area (AOI 8), where EDB concentrations were the highest. δ13C values increased toward the downgradient portion of the EDB plume (Koster van Groos et al., 2016)."

and

"δ13C values and EDB concentrations in the downgradient area of the plume (AOI 9) are consistent with the breakdown of EDB by the abiotic process of hydrolysis (Koster van Groos et al., 2016)."

NMED Comment: The reference provided, Koster van Groos et al., 2016, was not an independent study. This study was performed at the site, and the author is affiliated with the Permittee's contractor who was paid to perform the referenced study. In all future documents which cite this study, including the Phase II RFI report, the Permittee must clearly disclose that this study was associated with the BFFS site characterization.

24. Section 3.2.2, Analyte Selection, page 3-2, line 35; No response required.

Permittee Statement: "For all environmental media, the following classes of analytes are excluded because there is no evidence of any association between these analytes and the [fuel-related analyte] FRAs. There are multiple quarters of analytical data for many of these analytes indicating that they are non-detect in addition to being unrelated to Site FRAs."

NMED Comment: The Permittee is reminded that if a hazardous constituent is detected above its background level it is considered a contaminant of concern (COC) whether it is a "FRA" or not, and must be retained as a COC at the site. See also the definitions of hazardous waste, hazardous constituent, and extent of contamination in Permit Sections 1.8, 6.0, 6.2.3, and 6.2.3.1 of the KAFB Hazardous Waste Treatment Facility Operating Permit for the Open Detonation Unit.

25. Section 4.5.2, Indoor Air Sampling Results, page 4-17, line 10; Response required in the Phase II RFI Report.

Permittee Statement: "However, potential human health impacts from soil vapor are evaluated in the Risk Assessment (USACE, 2017)."

NMED Comment: Site characterization has continued at the site since 2016 when Phase I RFI work was been completed. Therefore, the Risk Assessment must be updated include data from 2016 through when site characterization is complete. See Comment 4 above. Additional investigation is necessary to characterize soil vapor contamination at the site, including the nature and extent of the soil vapor plume and vapor intrusion risks. Additionally, the Phase II RFI report must also present the physical parameters that will be used for future vapor intrusion risk analysis (e.g., soil type, porosity, etc. Include the physical parameters in the Phase II RFI report.

26. Section 6.3.4.3, Aquifer Testing Results, page 6-28, line 15; No response required.

Permittee Statement: "The results of the analysis of the step-drawdown and constant-rate aquifer tests were reported in the Aquifer Test Report for Groundwater Extraction Well KAFB-106228... The pumping and recovery data for KAFB-106228 were analyzed to determine aquifer characteristics."

NMED Comment: According to the Report, aquifer testing was only performed on one well and the test was unsuccessful. Aquifer tests are necessary to determine site-specific hydrologic parameters such as transmissivity, specific yield (or storativity), and hydraulic conductivity in order to obtain defensible data necessary to support groundwater modeling efforts, remedy evaluation, and remedy selection for the site. A single well test is not sufficient to determine aquifer properties at the site. At least two aquifer tests, one in the source area and one north of the leading edge of the EDB plume (e.g. at the ABCWUA Trumbull well cluster location), must be conducted. The aquifer tests must consist of step-draw down and constant discharge tests. Appreciable drawdown in observation wells must be observed before the constant discharge tests can be considered successful and to ensure that reliable and high quality data for determining transmissivity and hydraulic conductivity are obtained.

GENERAL 2020 COMMENTS on 2018 REPORT:

27. Appropriate Screening Levels; Response required in the Phase II RFI Report.

NMED Comment: All acceptable data must be compared to the corresponding screening levels in effect when investigation activities at the site are complete. These data must be included in an updated conceptual site model (CSM) presented in the Phase II RFI report

28. Risk Assessment Report; Response required in the updated Risk Assessment Report.

NMED Comment: An updated Risk Assessment Report must be submitted to NMED for review when site investigation activities are complete. The Risk Assessment Report must use the appropriate screening levels in effect at the time when site investigation activities are complete. See Comment 25 above.

29. The Nature and Extent of Soil Vapor Contaminant Concentrations and Vapor Intrusion; Response required in the Phase II RFI Report.

NMED Comment: Soil vapor contamination at the site is mentioned on page 8-2, Line 4; the Permittee states: "The nature and extent of soil vapor contamination at the site has been characterized." Soil vapor has not been adequately characterized at the site. The nature and extent of soil vapor contaminant concentrations and vapor intrusion must be addressed in the Phase II RFI report.

30. **Data Not Approved for Decision-Making Purposes;** Response required in the Phase II RFI Report.

NMED Comment: The following data are not approved. These data shall not be used for decision-making purposes at the site without presenting additional supporting information in the Phase II RFI report.

a. Portions of Pneulog® permeability data: The Permittee has calculated permeability of the subsurface based on flow within long screened intervals (134 to 175 feet). Data collected in this manner will indicate a decrease in permeability with depth, as flow rates are dependent on pressure. The Permittee has not discussed these issues or limitations within the Report. In the Phase II RFI report, the Permittee must discuss these limitations and remove all reference to specific permeability values or inferences thereof made from Pneulog® test results.
b. Geophysical Logs: A large portion of the geophysical logging conducted for the site is unreliable due to inaccurate calibration of the instrumentation resulting in inaccurate induction logs. These logs cannot be used to distinguish between coarser grained units, which are the predominant lithologies present throughout the site. However, the induction logs can be used qualitatively to identify clay layers and provide a means of correlating surfaces and some stratigraphic intervals across the site. The Permittee must ensure that instrumentation is properly calibrated when conducting future geophysical logging.

31. **Information Presented in Cross Sections;** Response required in the Phase II RFI Report.

NMED Comment: Multiple comprehensive cross sections are required in the Phase II RFI report. Cross sections must be prepared to portray a variety of critical information including, but not limited to:

a. Geologic units;
b. Top of the water table obtained from well gauging data;
c. Top of free phase LNAPL obtained from well gauging data;
d. Screened intervals of the wells used to construct the cross sections;
e. Photoionization detector (PID) data;
f. Concentrations of contaminants depicted at the sample location that the data represent;
g. Contours of contaminant concentrations to include laboratory data for soil contaminant plumes, laboratory data for vapor contaminant plumes, and laboratory data for groundwater contaminant plumes, as appropriate;
h. Indication of where cross sections intersect one another;
i. Pertinent above ground features such as roads, buildings, etc… for orientation; and

j. Vertical scales in both elevation above mean sea level and feet below ground surface.

32. Description of Regional, Sub-Regional, Local, and Site Hydrogeology; Response required a Phase II RFI Report.

NMED Comment: A more detailed description of the regional, sub-regional, local, and site-specific hydrogeology is required in the Phase II RFI report. The Permittee must better define the hydrogeology of each area to more accurately describe the extent of geologic units and explain how they affect contaminant migration at the site. This information will facilitate the understanding of the site's anisotropic conditions and how they affect contaminant migration. These descriptions will be useful when designing corrective measures for the site.

33. Changes in Groundwater Elevations and Gradient Over Time; Response required a Phase II RFI Report.

NMED Comment: The Phase II RFI Report must include a discussion of changes in the groundwater elevations and gradient over time and the causes of those changes (e.g., pumping stresses), describe current conditions at the site, and address potential impacts of possible future changes in the groundwater gradient on the dissolved phase contamination at the site (e.g., resuming, increasing, or discontinuing the use of various municipal wells in accordance with Albuquerque Bernalillo County Water Utility Authority (ABCWUA) projected plans, and seasonal use variations, at the time the report is written). Given the anticipated continual rise in groundwater levels, the Phase II RFI should discuss how recovery well pumping rates may need to change in order to account for changes in groundwater gradients toward the Ridgecrest well field.

Further, the locations where production wells exist today may remain the same over time because of well replacement and water resource management strategy needs (although pumping from Ridgecrest well field is still a worst-case scenario). Increased conservation and San Juan-Chama water dependence could shift the pumping center from its current location to another location in the basin. These factors must be discussed in the Phase II RFI as they will need to be considered when determining final corrective measures.

34. Updated Conceptual Site Model; Response required a Phase II RFI Report.

NMED Comment: The Phase II RFI report must contain an updated conceptual site model which incorporates all data collected at the site at the conclusion of investigation activities to provide an understanding of the physical, chemical, and biological processes that influence contaminant fate and transport to human and environmental receptors. Understanding these processes is critical for adequately conducting a corrective measures evaluation for final remedy selection.

35. Reporting Requirements; Response required in the Phase II RFI Report.

NMED Comment: No revisions to the Phase I RFI Report are required. However, to facilitate shorter and more efficient NMED review times, the Phase II RFI must follow reporting requirements outlined below. These comments have also been sent to the Permittee, in a separate letter, titled "Reporting Requirements For All Document Submittals" dated September 2, 2020:

a. A complete and accurate electronic red-line strike out (RLSO) version must be included in all future revised documents. The RLSO included with this Report did not include all changes that were made. This defeats the purpose of a RLSO version and results in longer NMED review times.
b. All appendices must appropriately paginated and include tables of contents, if necessary. In addition, all tables, figures, and included pages from previous reports must be appropriately numbered, including new and correct footers, headers, and titles, relevant to the appendix where they are presented.
c. All data tables must be of a manageable size, separated into logical sections or separate tables (e.g., chronologically or by investigation) to facilitate locating information. Portable document format (PDF) tables that are several thousand pages long that are not in chronological order and/or contain no subdivisions for different investigations are not acceptable.
d. Searchable, electronic versions of all data tables (i.e., Microsoft Excel format) must also be included on compact disk with the report in accordance with Section 6.5.18, Laboratory Analyses Requirements for all Environmental Media, of the Permit. This requirement was discussed with KAFB during a May 4, 2020 conference call with NMED; KAFB indicated that they would comply.
e. Lithologic logs must not be distributed among several appendices. Appendices A, B, C, and D each contain different sets of lithologic logs. In the Phase II RFI report and future reports, all relevant lithologic logs must be compiled into one appendix. All borings for which there are lithologic logs included in an appendix must be listed in a table of contents for that appendix.
f. Well installation and development records must not be presented in one appendix. In the Phase II RFI report and future reports, well installation and development records must be included in one appendix. Each well for which well installation and development records are included must be listed in a table of contents for that appendix.
g. All geophysical logging activities must ensure that the geophysical logging equipment is properly calibrated, and calibration records must be included in all relevant reports for investigation activities performed at the site after 2015.

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

SEP 08 2020

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Mr. Kevin Pierard and Mr. Dave Cobrain
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building 1
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Dear Mr. Pierard

As detailed in the attached Response to Comments (RTC) table, the Air Force has a number of concerns regarding the 04 March 2020 "Disapproval Ethylene Dibromide In Situ Biodegradation Pilot Test Report Bulk Fuels Facility Solid Waste Management Units ST-106 and SS-111 Kirtland Air Force Base, New Mexico EPA ID# NM6213820974 HWB-KAFB-19-011" (ISB Pilot NOD). Our concerns fall under the following four categories:

1. Comments that contradict scope previously approved by NMED.
2. Comments unrelated to the scope of the ethylene dibromide in situ biodegradation pilot (ISB Pilot).
3. Global directions for future work that go beyond this report.
4. Technical comments and clarifying questions.

Background

A pilot test is a focused, limited-scale test of a technology that is used to determine the potential effectiveness of the technology under field conditions and the feasibility of including it in the final remedy selection. Unlike interim measures, the design and implementation of pilot tests are not a requirement in Kirtland Air Force Base's (AFB's) Hazardous Waste Treatment Facility Operating Permit (HWTF Permit No. NM9570024423 (RCRA Permit). The Air Force's voluntary implementation of pilot tests, such as the ISB and bioventing pilots, reflects our continued commitment to progressing towards a robust, data-driven Corrective Measures Evaluation (CME).

The Air Force acknowledges that the current NMED staff assigned to oversee the Bulk Fuels Facility (BFF) corrective action was not involved in the initial development of the scope for the ISB Pilot during the spring of 2016. The genesis of the ISB pilot was work performed under the Environmental Security Technology Certification Program (ESTCP). This Department of Defense program was established in 1995 to promote innovative technology transfer. From the beginning, the focus of this pilot was solely on the biodegradation of EDB. The original Air Force proposal to ESTCP was for a push-pull test in a single well to evaluate if the addition of an amendment would stimulate bacterial growth around the well and facilitate the degradation of EDB. After several meetings in 2015 with NMED's Chief Scientist Mr. Dennis McQuillan and other technical stakeholders, the Air Force offered to pursue funding for a more robust pilot that would focus on the anaerobic degradation of EDB. This funding was subsequently secured, which led to the submittal of the ISB Pilot work plan to NMED on 26 October 2016.

As detailed in the work plan approved by NMED on 12 December 2016, the primary objective of the pilot test was to determine if the proposed amendments would enhance the anaerobic biodegradation of EDB. A secondary objective was to use data from the ISB Pilot to inform the evaluation of using in situ treatment of EDB in groundwater in the CME. The work plan detailed all aspects of the proposed pilot including, but not limited to, drilling methods, well design and monitoring activities. No additional work beyond this approved scope was anticipated by NMED or the Air Force, therefore, no funding has been allocated beyond the approved Phase 4 monitoring.

Comment Summary

The Air Force has previously emphasized the importance of being able to rely on prior commitments and direction from NMED. The ISB Pilot NOD does not reflect the discussions and agreement between Mr. Mark Correll, Deputy Assistant Secretary of the Air Force for Environment, Safety and Infrastructure, and NMED Cabinet Secretary James Kenney in our 07 January 2020 meeting that the Air Force has a right to rely on prior commitments and direction from NMED to ensure federal resources are spent appropriately to continue to move this project towards final remedy selection. It contains numerous comments that are either unrelated to the scope of work or contradict scope previously approved by NMED. For example, many of NMED's comments in the NOD focus on the "failure" of the EDB pilot to address the delineation of light non-aqueous phase liquid (LNAPL). Because the NMED-approved scope was limited to the evaluation of the anaerobic biodegradation of EDB, the lack of discussion in the report regarding the nature and extent of LNAPL is to be expected and is clearly not grounds for disapproval of the ISB Pilot Report.

The Air Force submitted a letter to NMED on 09 July 2020 regarding our request that NMED issue separate letters for global directions that go beyond a comment on an individual document. The attached RTC table highlights a number of these global comments in this NOD. Based upon a recent conversation with NMED staff, it is our understanding that NMED will be issuing a letter to address this request soon.

Additionally, the RTC table details the Air Force's responses to NMED's technical comments and questions that are related to the approved scope of work for the ISB Pilot. The Air Force looks forward to discussing these comments with NMED at the Department's convenience. The results of this meeting will facilitate the Air Force's revision of this report.

NMED approved the Air Force's 26 March 2020 extension request on 02 April 2020 and established a new ISB Pilot Report submittal date of 18 September 2020. To allow time for NMED's review of the RTC table, a meeting between NMED and the Air Force to discuss the RTC table and for the Air Force to revise the ISB Pilot report the Air Force respectfully requests an additional extension to 20 November 2020. This date was based on the assumption that the meeting would be held before the end of September.

If you have any questions or would like to schedule a call to discuss these issues further, please contact Mr. Sheen Kottkamp at 505-846-7674 or sheen.kottkamp.1@us.af.mil.

Sincerely

RYAN NYE, Colonel, USAF
Vice Commander

Attachments:
1. AF Draft Response to Comments Table and associated attachments
2. Scope of EDB ISB Pilot Test

cc:
NMED HWB (Pierard, Cobrain), letter and electronic
NMED RPD (Stringer), electronic only
EPA Region 6 (King, Ellinger), electronic only
SAF/IEE (Lynnes), electronic only
AFCEC/CZ (Cash, Kottkamp, Segura), electronic only
USACE-ABQ District Office (Moayyad, Phaneuf, Dreeland, Cordova, Kunkel), electronic only
Public Info Repository, Administrative Record/Information Repository (AR/IR) and File

40 CFR 270.11
DOCUMENT CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

RYAN NYE, Colonel, U.S. Air Force
Vice Commander, 377th Air Base Wing

8 Sep 20
Date

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

9 Sep 20
Date

<table>
<tr><th colspan="2">Ethylene Dibromide In Situ Biodegradation Pilot Test Report, Bulk Fuels Facility, Solid Waste management Units ST-106 and SS-111, Kirtland Air Force Base, New Mexico, EPA ID# NM9570024423, HWB-KAFB-19-011; letter dated March 4, 2020</th></tr>
<tr><th colspan="2">Comment Response to NMED NOD</th></tr>
<tr><th>NMED COMMENT</th><th>RESPONSE TO COMMENT</th></tr>
<tr><td>1. Inconsistency in the Designations of Wells
NMED Comment: The Permittee used multiple designations for wells in the Report. For instance, on Figure 2 of the Report, well KAFB-106008 is designated as KAFB-1068. Use of multiple designations for wells results in confusion for document reviewers and the public. The Permittee must use the official full designation for each well in every instance in all future documents submitted to NMED.</td><td>In order to avoid confusion and maintain consistency with recently submitted documents, well designations will be changed as appropriate throughout the revised Report (e.g., from KAFB-1068 to KAFB-106008 on Figure 2). As stated in the Air Force letter dated 16 July 2020, Air Force agrees with the global direction to consistently refer to wells by the same name. A list of wells associated with the Bulk Fuels Facility site, and a list of their current designations are included as Attachment 1 to this Response to Comments.

Please note that well KAFB-106008 was not associated with the pilot test and was only included for location reference.</td></tr>
<tr><td>2. Executive Summary, page ES-3
Permittee Statement: "The modified Phase 3 was approved by the NMED in a letter dated August 7, 2018 (NMED, 2018)."

NMED Comment: It should be noted that the NMED's letter dated August 7, 2018 approved the proposed modification under the following conditions: 1. Bioaugmentation shall remain as an approved, but deferred, component of the pilot test, and 2. The biochemistry/LNAPL technical working group shall meet as soon as practicable to review pilot test results and to discuss the deferral of bioaugmentation. The response letter must include details of the technical work group meeting where the deferral of bioaugmentation was discussed and along with any conclusions reached.</td><td>Comment noted. A technical working group (TWG) meeting was held on September 17, 2018 during which pilot test results were reviewed and the deferral of bioaugmentation was discussed. Given evidence of biostimulation of native bacteria and non-detectable or low EDB concentrations at pilot test wells, there was consensus that bioaugmentation was unnecessary at the time. The pilot test was conducted in accordance with the NMED-approved documents, which detail the technical approach.

The TWGs established for the BFF project are not required by Kirtland AFB's Hazardous Waste Treatment Facility Operating Permit (HWTF Permit No. NM9570024423) and are solely advisory. No formal minutes are kept by either NMED or the Air Force. As stated by Ms. Stringer in BFF Stakeholder meetings, the Hazardous Waste Bureau is responsible for scheduling TWG meetings if the Department believes they will support the CME.</td></tr>
</table>

3. Section 1, Introduction, page 1-1 Permittee Statement: "[Anaerobic in-situ bioremediation] ISB, with and without bioaugmentation, is a common remedial approach to treat chlorinated solvents such as trichloroethene and is a promising technology for promoting the degradation of EDB to nontoxic products." NMED Comment: Anaerobic in-situ bioremediation of chlorinated solvents (e.g., trichloroethene) produces toxic byproducts such as vinyl chloride. Some byproducts are recalcitrant under anaerobic conditions. Although Section 4.5.2, *EDB, EDB Degradation Products*, pages 4-20, discusses EDB degradation products, the discussion lacks detail; therefore, it is not clear whether or not EDB produces toxic byproducts under anaerobic conditions (e.g., bromoethane, bromoethanol, vinyl bromide). Provide a more detailed discussion regarding EDB toxic degradation byproducts under anaerobic conditions in the revised Report.	The most common anaerobic degradation pathway for EDB involves dihaloelimination resulting in the formation of ethene and bromide (Wilson et al., 2008; Henderson et al., 2008; Koster van Groos et al., 2018). Sequential hydrogenolysis to bromoethane and then ethane is also possible (Henderson et al., 2008). A minor branching product of tentatively identified vinyl bromide was observed in the laboratory under slower EDB hydrolysis degradation conditions, but vinyl bromide was not detected during anaerobic biodegradation studies (Koster van Groos et al., 2018). Due to low EDB concentrations in the field, concentrations of possible vinyl bromide and bromoethane products were likely low and challenging to measure under field conditions. It was not attempted. Bromoethanol is a possible aerobic product, but unlikely to form anaerobically. Additional text will be added to Section 4.5.2 regarding degradation products.
4. Section 1.3, Site History, page 1-3 Permittee Statement: "Based on historical Air Force fuel usage, AvGas containing EDB as a lead scavenger would have been in use from approximately the 1940s to 1975." NMED Comment: Aviation fuels are known to contain additives. Clarify whether or not the fuels currently used at the site contain other potentially toxic fuel additives in the revised Report.	The Permittee Statement was included to describe to the readers of the Report when AvGas with EDB was likely to have been used at the site. Current fuel use is unrelated to BFF corrective action activities.

5. Section 1.4, Site Conditions, pages 1-3 and 1-4 Permittee Statement: "Based on data reviewed for the pilot test design, the groundwater gradient in the pilot test area was less than 0.002 foot/foot (First Quarter 2016), and the direction of groundwater flow had shifted from north-northeast to a more east-southeast direction, likely due to continuing water-conservation practices and seasonal fluctuations, as discussed in the Second Quarter 2018 Quarterly Monitoring Report (USACE, 2018b)." NMED Comment: According to Figure 2, *Site Location Map*, extraction well KAFB-106EX1 is located downgradient (east-southeast) from injection well KAFB-106INl that is consistent with current groundwater flow direction; hence, well KAFB-106EX1 is likely effective to enhance the hydraulic gradient, recirculate groundwater in the vicinity, and facilitate the distribution of the injection fluid. However, extraction well KAFB-106EX2 is located upgradient (west-northwest) from injection well KAFB-106INl. Well KAFB-106EX2 is less effective for the distribution of the injection fluid as demonstrated during the tracer test. In the response letter, provide an explanation for the purpose of using well KAFB-106EX2.	The pilot test used one injection and two extraction wells to distribute amendments in the pilot test area. The use of two extraction wells rather than one facilitated greater overall flow rates and a shorter recirculation period. All three tracers used during the pilot test (fluorescein, deuterated water, and iodide) arrived at KAFB-106EX2 (~76 feet from injection well at the surface) prior to KAFB-106EX1 (~92 feet from the injection well at the surface). The tracer data demonstrated that injected water was distributed to monitoring wells surrounding the injection well and ultimately to both extraction wells. This system design was reviewed and approved by the NMED and provided clear evidence of EDB biodegradation at multiple monitoring locations/wells. Please refer to Attachment 2 for discussion of the pilot test scope and timeline of NMED approvals. No revision to the text will be made.
6. Section 1.4, Site Conditions, page 1-4 Permittee Statement: "Additionally, treatability testing using Kirtland AFB soil and groundwater showed that bioaugmentation with a known debrominating culture (SDC-9) significantly enhanced EDB degradation rates (Figure 3). These results indicated that ISB, by stimulating the activity of indigenous EDB degrading organisms (i.e., biostimulation) or bioaugmenting with a debrominating culture (e.g., SDC-9), showed promise for enhancing EDB degradation at Kirtland AFB." NMED Comment: According to Figure 3, *Concentrations of EDB in Anaerobic Microcosms Prepared with Aquifer Samples Collected from the BFF Source Area*, the microcosm vessel augmented with the debrominating culture demonstrated EDB degradation. However, other vessels amended with nutrients but only aimed to stimulate indigenous microbes did not appear to demonstrate EDB degradation. Accordingly, the statement is inaccurate and misleading. Correct the statement for accuracy or provide an	The text will be revised to improve its clarity and accuracy. We agree that treatments without SDC-9 did not provide evidence of EDB biodegradation in microcosm tests (Figure 3). However, numerous rounds of groundwater sampling showed that organisms known to dehalogenate EDB or its chlorinated analog, 1,2-dichloroethane, were present in site groundwater, as stated in this section of the Report. Thus, the two sets of results showed promise of ISB in different manners. Regarding the treatability tests, it is possible that the native bacteria at the site did not survive sample collection and/or under microcosm conditions, thus leading to the negative data in the laboratory. It is difficult to accurately simulate subsurface conditions in a laboratory setting. The pilot test was designed specifically to take both sets of results (microcosms and molecular analysis) into account. The phased design of the pilot test allowed for initial testing of biostimulation (i.e., to determine if the native dehalogenating bacteria could biodegrade EDB) and secondary bioaugmentation with SDC-9 if biostimulation did not work. Field scale biostimulation using lactate and inorganic nutrients was extremely effective, so bioaugmentation was unnecessary. If SDC-9

additional explanation regarding other vessels/methods that did not appear to demonstrate EDB degradation in the revised Report.	was added at the beginning of the pilot test with lactate and inorganic nutrients, it would not have been possible to determine whether the SDC-9 culture or native dehalogenating bacteria were responsible for the observed biodegradation of EDB. Please refer to Attachment 2, which discusses NMED approval of the modified Phase 3 event. As noted in NMED Comment #2 above, bioaugmentation remains "as an approved, but deferred, component of the pilot test." Given successful biostimulation of native bacteria and non-detectable or low EDB concentrations at pilot test wells, there was/is little reason to bioaugment as part of the scope of the pilot test. If applicable, bioaugmentation may be considered in the CME if ISB is evaluated for larger scale application.
7. Section 2.3, Well Design and Installation, page 2-3 Permittee Statement: "Existing monitoring wells KAFB-106063 (screened from 505 to 520 feet bgs [below ground surface], with top of screen approximately 25 feet below the water table) and KAFB-106064 (screened from 485 to 505 feet bgs, with top of screen approximately 5 feet below the water table) were used for groundwater monitoring during the pilot test, along with the other newly installed wells." NMED Comment: According to Appendix A, Site Photographs, a photograph shows that light non-aqueous phase liquid (LNAPL) was detected in well KAFB-106S2. Presumably, KAFB-106S2 is the same well identified as KAFB-1068 in Figure 2, Site Location Map. In the revised Report, correct the well nomenclature in Figure 2 as necessary to be consistent. Additionally, since well KAFB-106S2 is located upgradient of the pilot test area, LNAPL may be present in the pilot test area as well. Wells with screened intervals submerged below the water table are not appropriate to evaluate the presence or absence of LNAPL. Well KAFB-106063 was used to evaluate the intermediate groundwater zone for the purpose of the pilot test; therefore, the submerged screen is acceptable. However, well KAFB-106064 was used to evaluate the shallow groundwater zone; therefore, the screened interval must not be submerged. It is critical that the extent of LNAPL plume is delineated. If this issue has not already been addressed, submit a work plan to propose to replace submerged screened intervals of all monitoring wells installed to evaluate the shallow groundwater zone in the source area (e.g., KAFB-106064).	The site photograph in Appendix A is correctly labeled, "LNAPL bailed from KAFB-106MW1-S;" however, "LNAPL" will be changed to "NAPL" to be consistent with the Report text. As described in Section 3.7 on page 3-12 of the Report, NAPL was noted in KAFB-106MW1-S during QED pump installation (after well development). KAFB-106S2 is not the same well as KAFB-1068 (or well identification KAFB-106008 which is clarified in the revised document) or KAFB-106MW1-S. KAFB-106S2 and KAFB-106008 were not sampled as part of the ISB pilot test project. KAFB-106S2 was installed as part of the Source Zone Characterization. Specific information regarding this well is documented in the Source Zone Characterization Report, which was submitted to NMED on October 25, 2019. NAPL delineation was not the intent of the pilot test (refer to Attachment 2 for a brief description of the pilot test scope). KAFB-106064 was in place before the pilot test was designed and performed. While KAFB-106064 is traditionally described as a shallow well, it is acknowledged that its screened interval was submerged at the time of the pilot test. Data from KAFB-106064 were carefully evaluated, including through examination of injected tracers, and observations from KAFB-106064 were consistent with wells KAFB-106MW1-S and 106MW2-S, both shallow groundwater monitoring wells. Both KAFB-106MW1-S and 106MW2-S are located approximately 50 feet from KAFB-106064 and their screens intersect the water table. No revisions have been made to the text. Please also note that fifteen newly installed groundwater monitoring wells that are screened across the water table have been installed since 2018. Eight of these wells

7. Continued.	were installed in the source area. Nine of these were installed during the recent coring activities and are discussed in the Source Zone Characterization Report. Additional source area wells will be installed in accordance with the NMED approved *Work Plan for Data Gap Monitoring Well Installation KAFB-106248 to KAFB-106252* (KAFB, 2019).
8. Section 2.3, Well Design and Installation, page 2-4 Permittee Statement: "The two pairs of nested groundwater monitoring wells, two extraction wells, and one injection well were installed by Cascade Drilling (formerly National Exploration Wells & Pumps) using an Air Rotary Casing Hammer (ARCH) drill rig from January through March 2017. During borehole advancement, soil cuttings were logged every 5 feet by the site geologist in accordance with the Unified Soil Classification System and American Standard Test Method International D1586-84." NMED Comment: The Air Rotary Casing Hammer (ARCH) drilling method pulverizes soil cuttings and prevents the ability to observe details in soil cores such as presence or absence of fractures and exact locations of hydrocarbon stains. Undisturbed soil cores characterize the subsurface conditions more accurately and such information can maximize the effectiveness of remediation later on. Acknowledge the shortcomings related to the drilling method used in the revised Report.	The ARCH drilling method was determined to be the best approach for the installation of the tightly spaced wells required for the pilot test. This drilling method was approved by NMED and is authorized under RCRA Permit NM9570024423, Section 6.5.9. The use of NMED-approved drilling methods is not a "shortcoming" and no revisions to the text will be made. Photoionization detector readings were collected from the drill cuttings and were recorded by the geologist on the soil boring log. Collecting and interpreting undisturbed soils cores for the presence or absence of fractures or carefully identifying hydrocarbon stains was beyond the scope of the pilot test (Attachment 2).
9. Section 2.3, Well Design and Installation, page 2-4 Permittee Statement: "Soil drill cuttings from just above and in the saturated zone were screened for presence of NAPL and volatile organic compounds (VOCs) using a photo ionization detector (PID) to collect head space measurements. Drill cuttings were also visually inspected for evidence of staining. PID readings were recorded on the soil boring logs (Appendix C)." NMED Comment: The collection of soil samples for laboratory analyses is necessary for every boring in the source area. The soil sampling data will provide useful information to determine the extent of soil contamination. The described field screening method does not provide sufficient data for site characterization. Propose to collect soil samples from every boring at the site in all future work plans.	The specific objective of this pilot test was to assess EDB biodegradation in groundwater in a well-controlled study. Wells were specifically installed for this purpose and with necessary characterization of drill cuttings to support the study design. Further characterization of soil samples from the borings was beyond the scope of the pilot test (Attachment 2). All well installation and sampling activities were performed in accordance with the NMED-approved work plan. No revisions to the text will be made. The Air Force understands that this comment and others relating to other global directives are being addressed separately by NMED.

10. Section 2.3, Well Design and Installation, page 2-4 Permittee Statement: "Table 1 presents the completion details for the wells, including surveyed elevations and coordinates, and screen depths." NMED Comment: According to Table 1, Well Completion and Survey Data, the depth to groundwater and the depth to the screened interval in injection well KAFB-1061N1 are recorded as 477.00 feet bgs and 477 -497 feet bgs, respectively. The depth to the top of the screened interval coincides with the depth of the water table. However, the depth to the top of the filter pack is recorded as 467 feet bgs according to Appendix C, Well Installation Forms, which is 10 feet above the depth to the water table. Since the filter pack is positioned above the water table, the injection fluid applied from the well is likely to follow the least resistant pathway above the water table, rather than in the aquifer matrix due to the lack of the hydrostatic pressure. The screen and filter pack intervals should have been positioned below the water table. The pilot test data obtained from the injection wells with screened intervals positioned above the water table may generate positively biased· results for the shallow groundwater zone because injection fluids will be distributed in larger lateral extent on the groundwater interface. No revision required.	Comment noted. As suggested, no revision will be made to the text. Well installation was performed in accordance with the NMED-approved work plan. NMED reviewed and approved the draft well completion diagrams generated by the field geologist prior to initiating well installation. The comment illustrates the value of using appropriate tracers during the pilot test. These tracers captured the transport and distribution of water from injection to sampling location. Tracers were observed at KAFB-106064, which did have a submerged screen, at similar concentrations and time intervals as KAFB-106MW2-S and KAFB-106MW1-S, and at the intermediate wells, where the screens are 35+ feet below the water table. These tracer results demonstrated that injected water arrived at deeper sampling locations in addition to shallower locations.
11. Section 2.3.1, Groundwater Monitoring Well Installation, page 2-5 Permittee Statement: "The two shallow monitoring wells (KAFB-106MW1-S and KAFB 106MW2-S) were constructed with 4-inch diameter, Schedule 80, polyvinyl chloride (PVC) riser pipe; and the two intermediate wells (KAFB-106MW1-I and KAFB-106MW2-1) were constructed with 3-inch diameter, Schedule 80, PVC riser pipe." NMED Comment: The screened intervals for intermediate wells KAFB-106MW1-I and KAFB-1062-I were both installed at 513 - 523 feet bgs. According to Section 1.4, Site Conditions, the deepest depths of the water table at the site ranged from 500 to 502 feet bgs in 2009, which is approximately 25 feet below the current groundwater table. According to Appendix C, Well Installation Forms, the elevated PID readings are recorded at the depths ranging from 485 feet to 510 feet bgs in the borings installed in the pilot test area.	Comment noted. As suggested, no revision will be made to the text. NAPL delineation was not the purpose of the pilot test (Attachment 2). Please also note that fifteen newly installed groundwater monitoring wells that are screened across the water table have been installed since 2018. Eight of these wells were installed in the source area. Nine of these were installed during the recent coring activities and are discussed in the Source Zone Characterization Report, which was submitted to NMED on October 25, 2019. Additional source area wells will be installed in accordance with the NMED approved *Work Plan for Data Gap Monitoring Well Installation KAFB-106248 to KAFB-106252* (KAFB, 2019).

Adsorbed and submerged LNAPL may be present at depths of 485 feet to 510 feet bgs. The PID readings corresponding with the depth of the screened intervals for the intermediate wells (513 - 523 feet bgs) are relatively low; therefore, adsorbed LNAPL is unlikely to be present at the screened depth. These intermediate wells may be useful to evaluate the distribution of the injection fluids at the deeper groundwater bearing zone during the pilot test; however, since the screened intervals of the wells do not correspond with the depths where adsorbed/submerged LNAPL is present, these wells are not suitable for future LNAPL monitoring and remediation purposes. No revision required.	
12. Section 2.4.4, Pump Installation, page 2-11 Permittee Statement: "A 6-inch sanitary well seal and a 1.5-inch-diameter threaded steel pipe were installed in the injection well casing to convey water from the piping exiting the system Conex box to the screened interval of the injection well. The injection pipe extended down into the water column and was fitted with a 4-inch diameter, custom designed and fabricated down-hole flow control valve (FCV, manufactured by Baski, Inc.) to limit risks of cavitation within the pipe, and to minimize volatilization and aeration of the anaerobic recirculation water." NMED Comment: The flow control valve was used to regulate the injection flowrate, indicating that the injection was controlled by flowrate rather than pressure. Explain whether the injection flowrate was regulated by the height of the water column or the groundwater extraction flowrate or both. In addition, during the Phase 2 and Phase 3 periods of the pilot test, the height of the water column in the injection well significantly increased due to the biofouling of the screen. Unless this issue is resolved, the tested remedial approach would not be practicable for long-term or large-scale operations due to well screens clogging from biofouling and restricting the ability to add amendments to the contaminated groundwater. Discuss potential measures to resolve the issue in the revised Report.	The injection flow rate was controlled through regulation of extraction well pumping rates and was equal to the combined flow rate of the two extraction wells. The Baski down-hole flow control valve (FCV) was installed to provide sufficient backpressure to ensure that piping would remain full of water throughout the treatment system. This limited risks of cavitation, COC volatilization, and aeration of the anaerobic recirculation water. The text will be revised to clarify this. Wells installed under the pilot test were designed to recirculate groundwater together with treatment amendments to determine whether EDB biodegradation could be stimulated. The wells were designed to perform as necessary for the study as scoped and were not sized for extended operation. Well rehabilitation was not performed during the pilot test period described in the Report as it could have impacted or complicated interpretation of collected data. Contingencies for biofouling will be addressed under the CME when assessing this technology for larger-scale operation.

13. Section 2.6, Recirculation Pilot System Equipment and Materials, page 2-13 Permittee Statement: "The system was designed to extract groundwater from the two extraction well locations and reinject that groundwater in the injection well after tracer or amendment addition, at a design flow rate of up to 24 gpm." NMED Comment: According to Figure 6, Process Flow Diagram, and Figure 5, Recirculation and Amendment System Piping and Instrumentation Diagram, an injection or transfer pump that delivers the injection fluid is not depicted in the system. Explain how the fluid is delivered to the injection well without a transfer pump in the response letter. In addition, LNAPL is present at the site; however, the components depicted in the system do not appear to have a mechanism to remove LNAPL, if present, from the recovered groundwater. Explain how LNAPL is handled by the recirculation system in the response letter. The system must have a mechanism to remove LNAPL from the recovered groundwater.	A chemical feed pump was used to pulse the concentrated amendment solution from the amendment tank into the injection well piping located within the Conex box system (labeled as "Chemical Feed Pump" in Figure 5, Process Flow Diagram). This in-line injection allowed for introduction of amendments to the recirculation water stream under pressure. Sufficient pressure from the extraction well pumps existed to deliver groundwater through the amendment system and to the injection well without the need for additional pumps. Text in Section 2.6, page 2-17 will be revised for clarification. Pump intakes were designed to be below the water surface and NAPL was not expected to be entrained in extracted water. As NAPL was not expected in the process stream, the treatment system was not designed to remove NAPL and no mechanism to remove it from the recovered groundwater was in place. During and after recirculation operations, NAPL was not observed in the filters/filter canisters of the recirculation system (for particulate removal) or at injection well KAFB-106IN1. NMED reviewed and approved the system design. Refer to Attachment 2, which summarizes the scope of the pilot test.
14. Section 3.3, Phase 1 -Tracer Testing, page 3-3 Permittee Statement: "During the entire Phase 1 recirculation period, approximately 1,024,000 gallons of water were extracted and reinjected." NMED Comment: Based on the distance from the injection well to the extraction wells, aquifer thickness, effective porosity, and volume of groundwater extracted and reinjected, provide an estimate for how many pore volumes of groundwater were exchanged in the treatment zone. Additionally, provide the estimate of pore volumes exchanged for the subsequent phases of the pilot test. Include the calculations and discussion in the revised Report.	The system was designed to recirculate water and distribute water to monitoring locations to demonstrate in situ biodegradation of EDB. Tracers were used to provide evidence regarding the distribution and mixing of injected water to monitoring locations. The suggested calculations were not included in the scope of the approved work plan and the measured evidence of distribution at field scale provided by tracers is arguably stronger. Calculation and discussion of the estimated pore volumes exchanged within the treatment zone will not be included in the revised Report. If applicable, modeling of amendment distribution in the subsurface may be considered in the CME if ISB is evaluated for larger scale application.

15. Section 3.3, Phase 1-Tracer Testing, page 3-4 Permittee Statements: "The likely cause of the inaccurate [pressure transducer] readings was electrical interference from the extraction well pumps' power leads running down the well to the pump near the drop tubes where the transducers and their control wires were housed. As a result, manual water level readings were periodically measured using the Solinst water level meter. Manual water level readings are summarized in Table 5." and, "During recirculation system operation, it became apparent that the water level readings from pressure transducers located in the extraction well drop pipes were not accurate. While the readings returned to the SCADA were erratic, the overall trends in the data were decipherable." NMED Comment: The recirculation operation during the Phase 1 period was conducted from October 2 to November 3, 2017. According to Table 5, Manual Extraction Well Water Level Measurements, only three measurements (October 17, 23, and 31, 2017) were collected during that time. The data should have been collected more frequently, particularly at the beginning of the recirculation process because the drawdown data would be useful to determine the properties of the aquifer. In the revised Report, provide the original data initially collected from the pressure transducers and demonstrate how the data is decipherable. Additionally, correlate the erratic data collected from the pressure transducers with the limited data collected manually and provide interpreted data for the missing portion of the drawdown data between October 2 and 17, 2017, if possible.	Drawdown was monitored to avoid drawing water below the top of well screens and not to assess aquifer properties in any way. This monitoring was to be performed using pressure transducers, but after the inaccurate readings of water level provided by pressure transducers in the extraction wells became apparent during Phase 1, manual water level measurements were used to track water level from that time on. Aquifer testing was not included in the NMED-approved Work Plan, and it is not the intended goal of this pilot test (Attachment 2). The reference to transducer data will be removed by removing the following statement from Section 3.3 of the revised Report, “While the readings returned to the SCADA were erratic, the overall trends in the data were decipherable.”
16. Section 3.3, Phase 1- Tracer Testing, page 3-5 Permittee Statement: "The field water quality parameters, NAPL, and water level measurements were recorded on the purge logs for each well. Purge logs and sample collection logs are included as Appendix F." NMED Comment: Appendix F, Field Sampling Records, does not clearly indicate whether NAPL was detected in the wells. A photograph included in Appendix A shows the presence of LNAPL in the vicinity of the test site. In the response letter explain whether LNAPL was detected from the wells, and if so, provide the gauging data in the revised Report.	If NAPL was detected in the wells during sampling, it was recorded on the Sample Collection Log and/or the Purge Log. No NAPL was detected at the other groundwater monitoring wells after the initial observation at KAFB-106MW1-S during pump installation, or during monitoring and sampling activities conducted during the period described in the Report. NAPL was not detected at KAFB-106MW1-S after November 2017. A “Depth to NAPL” column will be added to Table 3 for measurements collected during groundwater sampling.

17. Section 3.4, Phase 2- Biostimulation, page 3-6 Permittee Statement: "During the recirculation period, groundwater was extracted and an easily fermentable sodium lactate-based substrate (WilClear Plus®, manufactured by JRW Bioremediation), nutrient (DAP), and conservative tracer (Kl) were added to the recirculated process water stream." NMED Comment: Commercially available remediation products were used for the pilot test. The Report does not include information for the products. Provide all available information for the products (e.g., safety data sheets) in the revised Report.	Safety data sheets will be included in Appendix G of the revised Report and appendix callouts updated accordingly. Safety data sheets were also included in the NMED-approved work plan.
18. Section 3.4, Phase 2 - Biostimulation, page 3-7 Permittee Statement: "A pulsed amendment injection scenario was implemented in an attempt to minimize biofouling in the injection well." NMED Comment: Explain how a pulsed amendment injection scenario would minimize biofouling in the injection well in the revised Report.	Amendment delivery into the recirculation water process stream, and thus the injection well screen, was pulsed such that there were periods of time when the recirculation process water contained biostimulation amendments and other times where the flow contained only recirculated groundwater. This was intended to flush the well screen and filter pack with water less conducive to biological growth and fouling. The process of pulsing amendments into the aquifer and contingencies for biofouling were included in the NMED-approved Work Plan. The injection well performed as required to meet the objectives of the pilot test and well redevelopment/rehabilitation was not recommended as it could have impacted or complicated interpretation of the data. Additional text will be added to Section 3.4, page 3-7 to clarify this statement.
19. Section 3.4, Phase 2 - Biostimulation, page 3-7 Permittee Statement:" ... an increase in mounding (up to 9 feet above static [476 feet bgs)) at the injection well was observed." NMED Comment: The water column increased to 467 feet bgs due to the mounding in the injection well. The depth to the top of the filter pack is 467 feet bgs according to Appendix C. The mounded water laterally asserts pressure through the interval of the filter pack and spreads above the groundwater interface. Based on the inappropriate design of the injection well, the data collected from the pilot test is likely biased (see Comment 10).	Well installation was performed in accordance with the NMED-approved work plan. NMED reviewed and approved the draft well completion diagrams generated by the field geologist prior to initiating well installation. There is little evidence that data collected during the pilot test are biased. Conservative tracers injected during the study demonstrated that water was distributed to wells with differing screen intervals. Based on tracer data, it is not clear how preferential flow might account for the orders of magnitude decreases in EDB observed during the pilot test.

20. Section 3.4, Phase 2 - Biostimulation, page 3-8 Permittee Statement: "Introduction of amendments using the new concentrations began on December 29, 2017. The active portion of Phase 2 was extended until February 7, 2018 to deliver the planned mass of amendments." NMED Comment: Clarify the design (target) concentrations of the amendments in the aquifer beneath the pilot test area and explain the basis for the design concentrations. Provide the calculations and explanation in terms of the total volume of groundwater to be recirculated, the mass and volume of amendments, and the stoichiometric/theoretical requirement of the amendments in the revised Report.	The goal of the carbon substrate amendment (primarily lactate) was to facilitate its fermentation with resulting production of hydrogen, which can be limiting for dehalogenation. Similarly, bioavailability of nitrogen and phosphorus can be limited so these were also amended. Estimated concentrations of carbon substrate and DAP were outlined in the NMED-approved work plan and were adjusted in the field as necessary. The treatability test (see Figure 3) using Kirtland AFB soils and groundwater utilized 100 mg/L of lactate and 50 mg/L of DAP, which helped provide a basis for loading. Due to possible concerns regarding distribution and sorption of amended substrate, and consistent with contractor experience and typical substrate loading rates (AFCEE et al., 2004) slightly higher concentrations of fermentable substrate were targeted (~300 mg/L). As lactate makes up approximately half of the estimated fermentable content of Wilclear Plus, approximately 150 mg/L of lactate was expected, consistent with what was measured during Phase 2 recirculation activities. However, these initial amendment concentrations were intended to be adjusted, if necessary, to achieve desired conditions. Prior to any amendment additions, the site groundwater was anaerobic and low quantities of alternate electron acceptors such as nitrate and sulfate were present. Quantities of bioavailable mineral electron acceptors (e.g., Fe and Mn) are also difficult to estimate. As stoichiometric/theoretical requirements to drive anaerobic remediation are often based on the demands of alternate electron acceptors (mostly absent in the present case), the low concentrations of these electron acceptors complicated such an approach. Similarly, the low concentrations of EDB were not expected to drive amendment requirements. Instead, treatability testing, contractor experience, and typical substrate loading rates (AFCEE et al., 2004) provided the general basis for target loading rates. Further information regarding amendment concentrations will be provided in the revised Report.

21. Section 3.4, Phase 2 - Biostimulation, page 3-8 Permittee Statement: "During Phase 2, approximately 11 feet of water level drawdown was observed at KAFB-106EX2 during active Phase 2 system operations. The flowrate at KAFB- 106EX2 was incrementally reduced to 7 gpm beginning on January 8 through January 22, 2018 to prevent drawdown of water below the top of the screened interval." NMED Comment: Contrary to the action taken during the operation of the Phase 2 period, it is appropriate to reduce the water level to intersect the screened interval in the extraction well. Eleven feet of water level drawdown is sufficient to reduce the water level below the top of the screened interval and it should have been maintained. The drawdown would have allowed LNAPL that may be present at the interface to be recovered from the extraction well. However, despite the benefit of potential LNAPL recovery, the flowrate was reduced to prevent drawdown of water below the top of the screened interval. The reduction of flowrate was intended to minimize aeration of groundwater. LNAPL recovery must be a primary focus of remedial efforts and must not be compromised. The issues associated with aeration of groundwater must be resolved by other means, as necessary. No revision necessary.	Comment noted. As suggested, no revision to the text will be made. The pilot test was performed specifically to investigate the potential for anaerobic in situ bioremediation of EDB (Attachment 2). The design and operation of the extraction wells was solely for this purpose and not for NAPL recovery. Drawdown of groundwater below the screened interval of the extraction wells was avoided to minimize aeration of extracted groundwater, which could have inhibited anaerobic EDB biodegradation and increased biofouling. Further, the aboveground treatment system was not designed to remove NAPL. Additionally, NAPL recovery was not included or approved by NMED in the Work Plan.
22. Section 3.5, Phase 3- Biostimulation, page 3-9 Permittee Statement: "Therefore, similar to Phase 2, the purpose of Phase 3 was to continue to evaluate biostimulation in the subsurface after distribution of treatment amendments in recirculated groundwater. Phase 3 also consisted of two operational periods, a recirculation/mixing (active) period, and a subsequent passive monitoring period (no recirculation)." NMED Comment: Since the Permittee did not implement an evaluation of bioaugmentation during the Phase 3 period of the pilot test, the testing conducted during Phases 2 and 3 appears to be almost identical. Explain the significance of conducting Phase 3 of the pilot test in the revised Report. Revise the Report to combine the discussion of Phase 3 with that of Phase 2, as appropriate.	Sections 3.4 and 3.5 describe the operations and monitoring activities during Phase 2 and 3 respectively, and it is prudent to accurately describe these individually. Phase 2 and Phase 3 were ultimately similar in terms of amendments provided. However, initial subsurface conditions were different, with lower initial EDB concentrations and the desired microbial community likely stimulated after Phase 2. As described in the Phase 3 EDB ISB Pilot Test Notification Letter to NMED, Phase 3 was conducted to assess further possible enhancement of EDB degradation kinetics and possible expansion of the treatment zone. Phase 3 also allowed for some validation of the performance observed during Phase 2. Since the two phases were performed sequentially with different baseline conditions, separate discussions will be retained, despite their similarities. Phase 2 and 3 associated sampling events are denoted separately and, for clarity, are also described separately.

23. Section 3.5, Phase 3 -Biostimulation, page 3-10 Permittee Statement: "Increased mounding was also observed throughout the active portion of Phase 3 at the injection well (see Figure 7), increasing to approximately 35 feet above the static level by the end of Phase 3 active recirculation." NMED Comment: Since the filter pack of the injection well is set above the water table, an excessive injection pressure (35 feet of water) likely further pushed the fluid laterally above the water table, rather than within the aquifer matrix. Due to the design of the injection well, the distribution of amendments is likely limited to the interface {see Comments 10 and 19). Additionally, the issue of well screen fouling must be resolved, if this remedy is to be considered as part of a future remedy. No revision necessary.	Comment noted. As suggested, no revisions will be made. It seems likely that much of the increased head at the injection well during recirculation resulted from fouling in the immediate vicinity of the well rather than throughout the aquifer itself. As previously noted in other comments, the added conservative tracers in the recirculated water were observed at the intermediate wells and it is not clear what evidence suggests that amendments were limited to the interface as suggested here and in earlier comments. The injection well performed as required to meet the objectives of the pilot test. Given its performance, well redevelopment/rehabilitation was not recommended during the test as it could have impacted or complicated data interpretation. Wells installed under the pilot test were not intended for extended operation. If ISB is evaluated for larger scale application as part of the CME, biofouling and well maintenance will be evaluated.
24. Section 3.5, Phase 3 -Biostimulation, page 3-11 Permittee Statement: "After approximately 40 minutes of pumping, the water level in the well was manually checked and found to have drawn down below the transducer to the level of the pump intake (492 feet bgs). Thus, it seemed the loss of well capacity suggested by the increased mounding at the injection well (shown on Figure 7) was preventing groundwater from flowing into the well to sustain pumped flow to the surface; likely due to fouling of the well screen." NMED Comment: Explain whether measures to remediate the biofouling were developed during the pilot test. If so, provide a detailed explanation in the revised Report. Unless the issue is resolved, the remedial approach would not be practicable for long-term or larger scale implementation (see Comments 12 and 23).	Refer to responses to Comments # 12, 18, and 23 for discussion of fouling during the pilot test.

25. Section 3.5, Phase 3 -Biostimulation, page 3-11 Permittee Statement: "As a result, of the decreased well capacity, sample collection using the injection well pump was no longer possible, and samples from KAFB-106INl were collected using a 0.85-inch by 36-inch stainless steel bailer lowered to the groundwater through the transducer drop tube." NMED Comment: It should be noted that the sample collected from the injection well was not representative of groundwater conditions. The sample collected from the injection well was likely the remaining injection fluid that is stagnant in the injection well. The data obtained from the sample must not be used in any decision-making process, such as the evaluation and selection of remedial alternatives, confirmation that an area meets contaminant standards, or conclusion that a site meets the requirements for a Corrective Action Complete status. No revision necessary.	Agreed. After the sampling pump at KAFB-106IN1 ceased operating, collecting samples by bailer was the only feasible option, albeit imperfect. Samples from KAFB-106IN1 were not relied upon to arrive at the conclusions of the pilot test. No revisions will be made to the text.
26. Section 3.7, NAPL Sampling, page 3-12 Permittee Statement: "Measurable NAPL was detected in the shallow nested well KAFB 106MW1-S during QED pump installation on September 5, 2017. Three separate measurements were collected using a Solinst interface probe and confirmed a thickness of approximately 0.27 to 0.31 feet. NAPL was not detected at any other shallow monitoring wells within or around the treatment zone, or in the injection well." NMED Comment: LNAPL was also present in well KAFB-106S2 that is located near the pilot test area. Unless the extent of the LNAPL plume is delineated and eliminated, the groundwater that is treated for dissolved phase constituents (e.g., EDB) will be re-contaminated by residual LNAPL. LNAPL will act as a source of the dissolved phase contaminants. It is essential to eliminate all recoverable LNAPL from the site (see Comment 30).	Comment noted. No revisions will be made to the text. To clarify, well KAFB-106S2 is not the same well as KAFB-106MW1-S and was not used for the ISB pilot test project. Groundwater monitoring well KAFB-106S2 (screened across the water table) is located near the pilot test area and has never had any indication of NAPL. Please refer to Attachment 2 for scope of the pilot test and separate efforts to evaluate and delineate the vertical and lateral extent of NAPL.

27. Section 3.7, NAPL Sampling, page 3-12 Permittee Statement: "The extraction wells were not gauged for NAPL, as the top of the well screens were designed to be installed below the static water level." NMED Comment: A primary focus for the remedy at the site is an abatement of LNAPL. Once LNAPL is abated, the concentrations of the dissolved constituents are likely to gradually decrease. Therefore, the screened intervals of the extraction wells should not have been designed to be submerged below the water table. In the future, the screened intervals of all shallow groundwater monitoring and recovery wells must intersect the water table to capture LNAPL unless otherwise pre-approved by NMED.	Comment noted. No revisions will be made to the text. Please refer to Attachment 2 for scope of the pilot test and separate efforts to evaluate and delineate the vertical and lateral extent of NAPL. The Air Force understands that this comment and others relating to LNAPL delineation and abatement, and other global directives are being addressed separately by NMED.
28. Section 3. 7, NAPL Sampling, page 3-13 Permittee Statement: "Additional product recovery was attempted on September 13 and 14, 2017, and approximately 60 milliliters [of LNAPL] were recovered and sent to the APTIM Lawrenceville laboratory." NMED Comment: APTIM executed the pilot test and prepared the Report. APTIM should not have sent the samples to an internal corporate-owned laboratory. Industry standards provide that all laboratory analyses should have been conducted by a certified and independent third-party laboratory to avoid the perception of conflict of interest. The analytical results reported from the laboratory affiliated with the consultant must be identified as such in the Report. Revise the Report accordingly.	When NAPL was discovered in September 2017 at KAFB-106MW1-S, samples were collected and sent to Pace Analytical and Clark Testing for certified analysis. An additional NAPL sample was collected and sent to APTIM's Biotechnology Development and Applications Group (BDAG) Laboratory in Lawrenceville, New Jersey to facilitate EDB CSIA funded through a separate research grant investigating EDB attenuation and remediation (ESTCP project ER-201331). All isotope data included in the Report were collected and analyzed through this separately funded project. The results of EDB CSIA are included in the Report as they provide a supporting line of evidence of EDB degradation. The application of this method for documenting EDB degradation is also discussed in a USEPA document on natural attenuation of lead scavengers from leaded fuels (Wilson et al., 2008). The methods used for stable isotope analysis are research methods, not industry standard methods and are performed by non-accredited laboratories such as the University of Oklahoma. Additional details regarding the separately funded EDB isotope work are provided in a recent peer-reviewed journal paper: Koster van Groos, P., P.B. Hatzinger, S. Streger, S. Vainberg, P. Philip, and T. Kuder. 2018. Carbon isotope fractionation of 1,2-dibromoethane (EDB) by biological and abiotic processes. Environ. Sci. Technol. 52, 3440-3448.

28. Continued.	The VOC analyses performed at APTIM's BDAG Laboratory were shared to provide additional information regarding the NAPL, but do not otherwise affect interpretations or conclusions of the Report or pilot test. Given the concern expressed in the comment provided by NMED and that APTIM's BDAG Laboratory is not specifically certified for VOC analyses, the relevant passage will be removed from the revised Report.
29. Section 3. 7, NAPL Sampling, page 3-13 Permittee Statement: "The $\delta^{13}C$ value of the EDB in the NAPL, as determined by the University of Oklahoma, was approximately -21 ± 2 ‰." NMED Comment: In the revised Report, discuss the implication of the finding associated with the C^{13} [sic] isotope analysis for the EDB in the NAPL in comparison to the ratios of isotopes for the EDB in the groundwater samples collected during the pilot test.	A brief discussion related to the carbon isotope composition of EDB in the NAPL was provided in Section 4.5.2, which states, "[t]he $\delta^{13}C$ values of EDB in the NAPL sample and at well KAFB-106EX2 were consistently the most negative with values of -16‰ or lower, which indicates they were the least degraded," and "[t]he baseline evaluation performed with samples collected prior to the pilot test included EDB $\delta^{13}C$ values as high as -5‰, significantly higher than the EDB of the NAPL and located at KAFB-106EX2, indicating significant isotope fractionation and providing further evidence of EDB degradation under ambient conditions at the site prior to the pilot test." Text referencing this later discussion will be added to Section 3.7 for clarity and consistency.
30. Section 3.7, NAPL Sampling, page 3-13 Permittee Statement: "The fall and rise of the water table during well installation and development may have impacted the vertical transport and subsequent distribution of NAPL in the lower vadose zone, capillary fringe, and top of the unconfined aquifer; causing the measureable [sic] NAPL at KAFB-106MW1-S." NMED Comment: Section 1.4 states, "[t]he deepest depth to water, representing the lowest historical groundwater elevation, measured at groundwater wells in the BFF source area ranged from approximately 500 to 502 feet bgs in 2009. In recent years, the water table has been rising due to water-conservation efforts by the Albuquerque community and reduction of pumping of production wells by Albuquerque Bernalillo County Water Utility Authority. As a result, the current vadose zone at the BFF site is approximately 455 to 480 feet thick." At the time the LNAPL release occurred, the water table was approximately 20 to 30 feet below the current depth of the water table. Therefore, adsorbed and submerged LNAPL may also be present at depths below the current groundwater interface. Propose to submit a work plan to investigate the	Comment noted. No revisions will be made to the text. Please refer to Attachment 2 for scope of the pilot test and separate efforts to evaluate and delineate the vertical and lateral extent of NAPL. Additional source area wells will be installed in accordance with the NMED-approved *Work Plan for Data Gap Monitoring Well Installation KAFB-106248 to KAFB-106252* (KAFB, 2019) to address continued water table rise and to further delineate the source area plume. Additional soil coring will be performed as part of this field effort.

vertical and lateral extent of LNAPL at the current groundwater interface and at depths below the current water table where LNAPL was likely trapped as the water table rose.	
31. Section 3.10, Quality Control, page 3-15 Permittee Statement: "Laboratory data packages are also provided in Appendix G-2." NMED Comment: Appendix G-2 was not included in the Report. Ensure that Appendix G-2 is included in the revised Report.	Appendix G-2 (renamed as Appendix I-2) will be included in the revised Report.
32. Section 3.11.1, Soil IDW, page 3-16 Permittee Statement: "All drill cuttings were containerized in plastic-lined, steel roll-off containers pending laboratory analysis for waste characterization and disposal. Each roll-off was sampled for waste characterization." NMED Comment: Provide more detailed information regarding the sampling method for waste characterization in the revised Report. More specifically, explain the frequency of sample collection (e.g., soil volume per sample), whether composite or discrete samples were collected, and the number of subsamples in a composite sample, if collected, in the revised Report.	Additional details regarding soil IDW sampling and characterization will be included in Section 3.11.1 of the revised Report.
33. Section 3.11.2, Liquid IDW - Development and Decontamination, page 3-18 Permittee Statement: "Non-hazardous waste manifests are included in Appendix H-3. Hazardous liquid IDW generated from development and decontamination activities was disposed of by Chemical Transportation, Inc. and Clean Harbors at Clean Harbors Deer Trail, LLC in Colorado. Hazardous waste manifests are included in Appendix H-4." NMED Comment: Non-hazardous waste manifests are included in Appendix H-4 and hazardous waste manifests are included in Appendix H-3 of the Report. Correct the typographical errors in the revised Report.	The appendix callout errors will be corrected in the revised Report. Non-hazardous waste manifests will be included as Appendix J-3, and hazardous waste manifests included as Appendix J-4.

34. Section 4.2.2, Tracer Distribution During Phase 2 and 3, Phase 2, page 4-5 Permittee Statements: "Also evident in the iodide data is that final concentrations observed at the nearest monitoring wells of 17 mg/L (KAFB-106MW2-S) and 18 mg/L (KAFB- 106064) are equivalent with injected iodide concentrations (KAFB-1061N), which indicates that most of the groundwater observed at these wells was previously amended and reinjected." and, "Overall, iodide concentrations observed during the Phase 2 recirculation period indicated good distribution of injected waters, particularly within the treatment zone encompassing the shallow monitoring wells nearest to the injection well." NMED Comment: The tracer volume injection into the aquifer is estimated to be less than 30% of pore volume for the radial distance between the injection well and well KAFB-106MW2-S. Therefore, the highest concentrations of the tracer detected in the wells cannot be equivalent to the tracer concentrations of the injection fluid if uniform distribution of the injection fluid was achieved within the aquifer matrix. The top depth to the filter pack was set above the water table; therefore, the injection fluid may have migrated above the groundwater interface without being adequately mixed in the aquifer. Consequently, an undiluted or less diluted tracer solution may have reached the wells and been detected in the samples collected from the wells. The injection well construction likely provides positively biased data (see Comments 10, 19 and 23).	The comment states, “the tracer volume injected into the aquifer is estimated to be less than 30% of pore volume for the radial distance between the injection well and well KAFB-106MW2-S. Therefore, the highest concentration of the tracer detected in the wells cannot be equivalent to the tracer concentrations of the injection fluid if uniform distribution of the injection fluid was achieved within the aquifer matrix.” This is inaccurate. Perhaps the distance to KAFB-106S2 rather than KAFB-106MW2-S was considered during drafting of this comment. KAFB-106MW2-S was associated with this pilot test and KAFB-106S2 was not. As demonstrated in Table 16 of the Report, 106MW2-S is located 28 feet (at the surface) from the injection well. Conservatively, assuming an average thickness of water flow of 50 feet and a reasonably conservative effective porosity of 0.33, then the pore volume between the injection well and KAFB-106MW2-S is: $(28\ ft)^2 * \pi * 50 ft * 0.33 = 40{,}640\ ft^3 \sim 304{,}000\ gallons$. Similar math for KAFB-106064 results in a conservative pore volume estimate of ~373,000 gallons. Given that approximately 960,000 gallons of water containing the tracer were recirculated during Phase 2 of the pilot test, it seems extremely likely that the iodide concentrations observed at KAFB-106MW2-S and KAFB-106064 (within ~30% of the expected injected concentrations) support the conclusion that “most of the groundwater observe at these wells was previously amended and reinjected.” It is unclear what evidence exists suggesting positive bias in the data. The data are accurate, and many lines of evidence supported the broader conclusions of the Report. No revisions will be made to the text.

35. Section 4.2.3, Distribution of Fermentable Substrate, page 4-7 Permittee Statement: "Recirculated groundwater during Phase 2 and Phase 3 was amended with WilClear Plus®, which served as a fermentable substrate to stimulate debrominating organisms in the subsurface during the pilot test." NMED Comment: Although the Permittee asserts that debrominating organisms are present at the site, the data provided in Figure 3, Concentrations of EDB in Anaerobic Microcosms Prepared with Aquifer Samples Collected from the BFF Source Area, indicate otherwise (see Comment 6). The result of the microcosm study appears contradictory; however, the pilot test successfully demonstrated the occurrence of in-situ EDB degradation through carbon isotope analysis of EDB. No revision necessary.	Please refer to Comment #6 and the detailed response in reference to the microcosm tests described in Figure 3. As noted, the data from the microcosms and the molecular analysis of groundwater samples were at odds (i.e., dehalogenating bacteria were present in the aquifer, but they did not active in laboratory microcosms). The field study was designed in phases, in part, because of these results. As suggested, no revision will be made.
36. Section 4.2.3, Distribution of Fermentable Substrate, page 4-8 Permittee Statement: "While lactate was introduced to the subsurface at around 110 mg/L, concentrations at monitoring wells never exceeded 4 mg/L." NMED Comment: Provide information regarding the volume of the lactate solution introduced through the injection well in the revised Report.	The volume of fermentable substrate introduced during each recirculation phase (Phases 2 and 3) were provided in Table 6, which is referenced in Sections 3.4 and 3.5.

37. Section 4.2.3, Distribution of Fermentable Substrate, page 4-8 Permittee Statement: "The observed increases in acetate and propionate strongly suggest that organic substrate capable of stimulating reductive debromination of EDB was distributed to most wells during the pilot test." NMED Comment: Lactate is fermented to acetate and propionate by various bacteria and is not limited by debrominating bacteria. The statement is speculative and can be misleading. Revise the statement for accuracy.	The relevant paragraph will be revised to provide better clarity that the fermentative conditions indicated by lactate transformation are conducive to reductive debromination of EDB. Many resources are available in the literature that explain the overall paradigm of anaerobic bioremediation of halogenated substances. While the exact mechanism for each case of reductive dehalogenation is not known, for many cases, dehalogenating organisms of interest (e.g., *Dehalococcoides* spp.) utilize dissolved hydrogen (H_2) as their electron donor and a halogenated species (e.g., TCE or EDB) as their terminal electron acceptor. Through such a mechanism these dehalogenating organisms respire or "breath" the organohalide species, much as our cells respire oxygen. Fermentation of organic substrates by separate populations of fermenting organisms (i.e., not the dehalogenating species themselves) has been identified as a suitable manner for developing hydrogen species in situ. This mechanism provides much of the foundation supporting the practice of anaerobic in situ biodegradation for halogenated compounds and many different types of substances may stimulate fermentation and hydrogen production. In the source area at Kirtland AFB, it is almost certain that some fuel related hydrocarbons are fermented resulting in elevated H_2 concentrations which may be utilized by naturally occurring dehalogenating organisms. As noted in the Report, baseline data provided some evidence that this "natural" attenuation process, stimulated by the co-occurring fuels has likely attenuated EDB at the site without significant intervention. Through study and practical experience, lactate has found use as an effective substrate to rapidly stimulate hydrogen production. Many fermenters can utilize it resulting in quick and efficient production of hydrogen, as well as acetate and propionate products. The statement in the Report was intended as an observation of evidence (through elevated concentrations of lactate fermentation daughter products acetate and propionate) that the overall EDB debrominating system was likely stimulated at most wells through distribution of lactate. The text will be revised to clarify the discussion.

38. Section 4.3, Microbial Analysis, page 4-9 Permittee Statement: "This increase in EBAC [eubacteria] after Phase 1 recirculation activity may be the result of organic carbon and nutrient redistribution in the treatment zone along with the increased groundwater flows due to recirculation." NMED Comment: Although the carbon substrate and nutrients were not distributed during the Phase 1 period of the pilot test, the measured microbial population increased approximately two orders of magnitude. The increase in microbial population occurred before the biostimulation period was implemented. The observation indicates that microbial population can be increased with or without biostimulation amendments. Since hydrocarbon constituents (e.g., benzene, toluene) are ubiquitous in the groundwater, they may also be utilized as carbon substrates by anaerobic bacteria. In this case, an amendment of appropriate electron acceptors (e.g., sulfate) may further increase microbial populations and enhance biodegradation of the contaminants. Figure 19, APS Concentrations-All Wells, indicates that the population of sulfate reducing bacteria in groundwater samples collected from all wells except injection well KAFB-106IN plateaued during the Phase 2 and Phase 3 biostimulation period of the pilot test; sulfate may be a limiting factor for the population growth. Evaluate whether an amendment of appropriate electron acceptors enhances biodegradation of contaminants without compromising EDB degradation. Provide the discussion in the revised Report.	The quoted Permittee Statement is focused on redistribution of carbon and nutrients that were present in the subsurface prior to the introduction of amendments. Increased groundwater flows and groundwater extraction from differently impacted depth intervals during the recirculation periods of the pilot test will have facilitated redistribution of these materials within the aquifer without provision of amendments. We acknowledge that extra mixing/redistribution in the subsurface likely increased the nutrients and bioavailability of hydrocarbons that can be fermented to support reductive debromination of EDB, which has likely been occurring at the site without significant intervention for some time. The pilot test was specifically focused on EDB degradation and discussion of benzene and toluene was provided to place observed EDB degradation in context. Introduction of supplemental electron acceptors (such as sulfate) to enhance hydrocarbon degradation and impacts of elevated concentrations of such competing electron acceptors upon EDB degradation was outside the scope of the pilot test. The Report will not be revised to include a discussion of these issues.

39. Section 4.3, Microbial Analysis, page 4-9 Permittee Statement: "As with the high cell numbers prior to recirculation and amendments at the site, the large numbers of organisms capable of reductive debromination (10^5 to 10^6 cells/ml for DHBt, and around 10^5 cells/ml for DSB) after biostimulation, suggest that EDB debromination activity may have been stimulated during the pilot test." NMED Comment: According to Figure 21, DHBt Concentrations -All Wells, and Figure 24, 058 Concentrations -All Wells, the populations of DHBt and DSB appear to have plateaued during the Phase 2 and Phase 3 biostimulation period of the pilot test in all wells. These figures suggest that EDB debromination activity may not be stimulated by carbon substrate and nutrient amendments. The increase of the DHBt and DSB population was observed in groundwater samples collected from intermediate wells KAFB-106063, KAFB-106MW1-I and KAFB-106MW2-I during the Phase 1 period that was not related to biostimulation. Correct the statement for accuracy, discuss the implication of the observed population growth, acknowledge that other conclusions could be reached, and state that the data is not conclusive in the revised Report.	The text discussing cell populations of likely debrominating organisms will be revised. We agree that such data do not provide conclusive evidence of degradation activity, and must be supported by other lines of evidence Bacterial counts of DHBt, DSB, etc., quantified through qPCR analyses of DNA are imperfect measures of activity. Little change in already high numbers should not be interpreted as evidence of no change in overall debromination activity. While large population numbers typically correspond to greater activity, the presence of cell DNA itself doesn't indicate whether the organisms are actively expressing genes of interest or otherwise performing the roles associated with their presence. It does suggest, however, that they may be stimulated to activity, if not active already. The enumerated organisms are also representative of a likely more diverse community of dehalogenating organisms and are only quantified through the use of qPCR probes of varying specificity. It is probable that other organisms facilitating dehalogenating processes were not specifically quantified using this tool. Overall, the presence of the organisms at high numbers provide a strong line of evidence that supports the conclusion that observed EDB decreases were the result of anaerobic biodegradation. Increased counts at the intermediate wells were noted for many different organisms and were likely indicative of more oligotrophic conditions at these wells (e.g., lower hydrocarbon concentrations) prior to any recirculation. Given such conditions, recirculation of labile hydrocarbons to these deeper locations during Phase 1 likely increased microbial activity at these intervals.

40. Section 4.4, Geochemistry, pages 4-10 and 4-11 Permittee Statement: "DO [dissolved oxygen] concentrations were below 1 mg/L at all wells, with most concentrations below 0.5 mg/L." and, "The low DO concentrations within the treatment zone reflect favorable conditions for reductive debromination of EDB." NMED Comment: The site groundwater is anaerobic due to the presence of hydrocarbons which favors reductive debromination of EDB. Hydrocarbons in the aquifer may serve as carbon substrate to degrade EDB anaerobically. When dissolved hydrocarbons are utilized for EDB debromination, the concentrations of hydrocarbons may also decrease which provides synergistic degradation. However, carbon substrates (e.g., lactic acid) that were amended to stimulate indigenous bacteria are more readily utilized in comparison to hydrocarbons. Subsequently, the degradation of hydrocarbons may potentially be hindered. Since EDB may be naturally degrading due to the current site conditions (e.g., anaerobic conditions, presence of hydrocarbons), the amendment of the carbon substrate may not be useful. Evaluate the necessity of the amendment to balance the EDB and hydrocarbon constituents degradation and provide the discussion in the revised Report.	This comment is partially addressed in response to Comment #37 above. The supplied carbon substrate (lactate) likely increased dissolved hydrogen concentrations in the groundwater more rapidly than fermentation of the more complex hydrocarbons otherwise present at the site. This elevated hydrogen likely resulted in the enhanced EDB biodegradation that was observed. We acknowledge, however, that EDB is very likely attenuating in the source area without intervention, facilitated by the fermentation of hydrocarbons in the subsurface as suggested in the NMED comment. Evaluating tradeoffs between degradation of EDB and hydrocarbons as suggested by the comment was beyond the scope of the pilot test (Attachment 2).No revision to the text will be made.
41. Section 4.4, Geochemistry, page 4-11 Permittee Statement: "With the exception of KAFB-106EX2 (25 mg/L), sulfate concentrations in shallow wells were low (<5 mg/L) under baseline conditions presumably due to past sulfate reduction to sulfide." NMED Comment: Sulfate is a critical component for anaerobic biodegradation of dissolved hydrocarbon constituents. Since hydrocarbons are present in addition to EDB at the site, hydrocarbons must be remediated as well. According to Figure 19, APS Concentrations -All Wells, the population of sulfate reducing bacteria is abundant; however, sulfate concentrations appear to be insufficient to increase the activity of the sulfate reducing bacteria. Evaluate the viability of sulfate amendment to promote biodegradation of dissolved phase hydrocarbons in the revised Report (see Comment 38) and propose to submit a work plan for a pilot test to evaluate the effect of sulfate amendment, as appropriate.	The objective of this pilot test was to stimulate in situ anaerobic biodegradation of EDB (Attachment 2). Sulfate concentrations were evaluated as they are indicative of biogeochemical conditions. While the fate of other dissolved organics was tracked, the primary focus was EDB. Evaluating relationships between sulfate and hydrocarbons was beyond the scope of the pilot test. See response to Comment #38. No revisions will be made to the text.

42. Section 4.4, Geochemistry, page 4-11 Permittee Statement: "The low sulfate concentrations within the treatment zone reflect favorable conditions for reductive debromination of EDB." NMED Comment: Clarify whether elevated sulfate levels inhibit reductive debromination of EDB in the revised Report. Also, propose to submit a work plan to evaluate the sulfide concentrations in the groundwater; if sulfide levels are too high in the groundwater, sulfate amendment may not increase the activity of sulfate reducing bacteria.	Sulfate was monitored during the pilot test as a general geochemical indicator. The Permittee Statement has been revised to clarify that low sulfate concentrations, or the observed decrease in sulfate concentrations, at the site are reflective of reducing conditions which were favorable for reductive debromination. Impacts of differing sulfate or sulfide concentrations on EDB biodegradation were outside the scope of the study and were not specifically investigated. Site specific comments on these factors would be speculative and no revisions will be made to the text.
43. Section 4.4, Geochemistry, page 4-12 Permittee Statement: "Due to the low solubility of ferric (Fe(III)) iron under circumneutral conditions as found at the site, dissolved iron concentrations are often assumed to reflect concentrations of more reduced ferrous (Fe(II)) iron. Minerals containing oxidized Fe(lll) are fairly ubiquitous and elevated dissolved iron concentrations are usually indicative of iron reducing environments. Baseline measurements at the site indicated dissolved iron concentrations ranging from 1 mg/L (KAFB-106MW1-S) to 12 mg/L (KAFB-106MW2-S) in shallow wells, but concentrations at deeper, less impacted wells were all less than 1 mg/L." NMED Comment: According to Figure 27, Iron (Dissolved) Concentrations -All Wells, the dissolved iron concentration in the baseline groundwater sample collected from intermediate well KAFB-106MW2-I exceeds 11 mg/L. Accordingly, the statement is not accurate. Correct the statement or Figure 27 to resolve the discrepancy in the revised Report. Additionally, the dissolved oxygen concentration in the baseline groundwater sample collected from the same intermediate well KAFB-106MW2-I is recorded as approximately 1.8 mg/L, which is higher than the most wells according to Figure 25, Dissolved Oxygen -All Wells. The inverse relationship between the levels of dissolved iron and oxygen is not clearly demonstrated by the data collected during the pilot test. Remove or revise the statement, as appropriate.	The Report and figure are both correct. It is possible that NMED misread the figure due to similar color and symbol between 106MW2-S and 106MW2-I? Baseline concentrations for KAFB-106MW2-I are provided in Table 14, and indicate results of 0.053 mg/L and 0.0514 mg/L for parent and field duplicate samples, respectively.

44. Section 4.4, Geochemistry, page 4-12 Permittee Statement: "During the Phase 2 recirculation period when lactate amendments were introduced, methane concentrations generally fell again, but increased by many OOM [(orders of magnitude)] at several wells during the following passive period, with concentrations exceeding 10,000 µg/L at the injection well and KAFB-106MW2-S." NMED Comment: Methane may be beneficial to EDB remediation since it is considered a viable substrate for similar halogenated compounds (e.g., chlorinated ethenes). However, methanogens are known to produce ethene and ethane under the presence of brominated compounds (e.g., EDB). If methanogens produce more ethene and ethane which are main end products of EDB, they may potentially hinder degradation of EDB (e.g., via Le Ch atelier's principle). Regardless, the increased methane production is merely an indicator of bacterial activity but not necessarily effective remediation. No revision or response required.	The Permittee Statement is a factual presentation of the methane concentrations observed. No revisions will be made to the text. Methane may indeed be a viable substrate for aerobic EDB degradation by methanotrophs, as demonstrated by Koster van Groos et al. (2018), through a process called aerobic co-metabolism. Although microaerophilic conditions and contributions from this degradation pathway may occur, this is not an anaerobic process, and is very unlikely to outweigh the contributions from known anaerobic degradation pathways in an anaerobic environment. The comment states, "methanogens are known to produce ethene and ethane under the presence of brominated compounds (e.g., EDB)." The current scientific consensus and EPA guidance (Wiedemeier et al., 1998) indicates that ethene and ethane are known and expected daughter products of reductive dehalogenation, and important indicators of degradation, even in the presence of methane and presumably methanogenesis. Some early literature (Belay and Daniels, 1987; Holliger et al., 1992) suggests that methanogens may dehalogenate some chlorinated and brominated ethanes, forming ethene and ethane as daughter products. However, these studies predated the discovery of true dehalogenating strains (e.g., Dehalococcoides and Dehalogenimonas) and may be inaccurate. Even if correct, this observation confirms formation of ethene/ethane as daughter products of halogenated compounds, rather than production from CO_2 or methane. We agree that increased methane production is expected and not an indicator of effective EDB remediation.

45. Section 4.5.1, Benzene and Toluene, page 4-14 Permittee Statements: "With the exception of the injection well (KAFB-1061N1) and monitoring well KAFB-106MW1-S, benzene concentrations in shallow monitoring wells for the remainder of the pilot test ranged in concentration from 1,680 µg/L at KAFB-106MW2S to 4,400 µg/L at KAFB-106EX2, indicating limited losses due to biodegradation or abiotic mechanisms (e.g., volatilization, dilution)." and, "Interestingly, benzene increased during the passive periods at the shallow well KAFB-106MW1-S to concentrations as high as 9,800 µg/L. The higher concentration at KAFB-106MW1-S is similar to baseline conditions prior to recirculation and may be the result of increased mass transfer from residual NAPL phases, as NAPL had previous[ly] been observed at that location." NMED Comment: Unless LNAPL is eliminated, LNAPL constituents will constantly leach into the groundwater and re-contaminate the aquifer. In order to abate LNAPL, the extent of LNAPL plume must be delineated laterally and vertically (see Comment 30). The reduction of all dissolved phase constituent concentrations will likely occur once the bulk of LNAPL is removed from the site.	Comment noted. No revisions will be made to the text. Please refer to Attachment 2 for scope of the pilot test and separate efforts to evaluate and delineate the vertical and lateral extent of NAPL
46. Section 4.5.1, Benzene and Toluene, page 4-15 Permittee Statement: "Interestingly, toluene concentrations decreased during Phase 4 passive monitoring at shallow wells KAFB-106MW2-S to 150 µg/L (from 4,900 µg/L in the previous sampling event) and KAFB-106064 to 960 µg/L (from 11,000 µg/L in the previous sampling event). These decreases were far greater than for benzene and may indicate some anaerobic biodegradation of toluene." NMED Comment: Toluene is known to be more bioavailable as a carbon substrate than benzene. Presumably, anaerobic bacteria responsible for hydrocarbon degradation depleted the amended carbon substrates (e.g., lactate) during the Phase 4 passive monitoring period and initiated utilization of subsequently bioavailable hydrocarbon constituent, toluene. Further decline of toluene levels may be expected along with the decline of benzene level later in the passive monitoring period. Clarify whether the passive	Comment noted. No revisions will be made to the text. The pilot test was focused on EDB biodegradation (Attachment 2). Toluene and benzene were discussed to place EDB degradation in context. Anaerobic degradation of toluene coupled to a variety of electron acceptors is a well-known process and the decrease in toluene was evident, so it was factually presented. Long-term monitoring is on-going. Samples were collected in March and May 2020. Analytical results will be presented in the Q2 2020 Quarterly Monitoring Report.

monitoring is on-going at this time and provide a reference that presents the most recent analytical data in the revised Report.	
47. Section 4.5.2, EDB, EDB Degradation Products, pages 4-20 and 4-21 Permittee Statements: "Based the assumption of reductive debromination and its stoichiometry, equivalent quantities of EDB degraded can be estimated using measured concentrations of ethene and ethane ... "and, "During and after the Phase 2 recirculation period, estimates of EDB equivalents degraded based on ethene and ethane increased to magnitudes similar to initial EDB concentrations, suggesting substantial conversion. The highest estimate of EDB equivalents degraded occurred at KAFB-106MW1-S after Phase 3 biostimulation efforts with an estimated concentration of approximately 270 µg/L." NMED Comment: According to Tables 7 through 15, the concentrations of ethane, ethene, and methane were detected in the baseline groundwater samples collected from the pilot test wells. These dissolved gas constituents may or may not be degradation products of EDB. Since other hydrocarbon constituents (e.g., benzene and toluene) are concurrently present with EDB and the degradation products (ethane, ethene, and methane) are not exclusive to EDB biodegradation products, the quantity of degraded EDB cannot be estimated by measured concentrations of ethene and ethane. It should be noted that methanogens produce ethane and ethene under the presence of halogenated compounds and the presence of brominated compounds drives methanogens to produce even more ethane and ethene from small organic compounds such as carbon dioxide. Remove the statements from the revised Report.	The text will be revised to indicate that estimates of EDB degraded using ethene and ethane product concentrations assumed stoichiometric conversion as well as negligible contributions of ethene and ethane from sources other than EDB. Of the three gases discussed in NMED's comment, only ethene and ethane are anaerobic degradation products of EDB. Laboratory studies have demonstrated near complete dehalogenation of EDB to form ethene. Production of ethane from ethene or from bromoethane under reducing conditions also has been demonstrated (e.g., Henderson et al., 2008). The comment states, "it should be noted that methanogens produce ethane and ethene under the presence of halogenated compounds and the presence of brominated compounds drives methanogens to produce even more ethane and ethene from small organic compounds such as carbon dioxide." This statement is inconsistent with the current scientific consensus and EPA guidance (Wiedemeier et al., 1998) that ethene and ethane are daughter products of reductive dehalogenation, even in the presence of methane and methanogenesis. It would be helpful if NMED provided information that demonstrates widespread ethene and ethane synthesis from carbon dioxide by methanogens. As previously noted, early scientific literature (prior to discovery of *Dehalococcoides* sp.) suggested that methanogens may dehalogenate some chlorinated and brominated compounds to ethane and ethene (Belay and Daniels, 1987; Holliger et al., 1992); but this is very different than de novo synthesis of ethane or ethane from carbon dioxide. Rather, they are daughter products of the halogenated compounds and a critical line of evidence of their biodegradation as per our conclusion and per EPA guidance. Laboratory results indicating near stoichiometric conversion of EDB to ethene, and EPA guidance and environmental practice of utilizing ethene and ethane as daughter products for mass balance determinations of chlorinated solvents in methanogenic environments support the Air Force's statements. In fact, the presence of ethene and ethane provide strong evidence of the processes described.

48. Section 4.5.2, EDB, EDB Degradation Products, page 4-22 Permittee Statement: "The largest apparent increase in bromide to chloride ratio occurred during and after the Phase 3 recirculation period. This coincided with use of a new certified analytical laboratory after the original analytical laboratory measuring bromide ceased operations. Several of the increases in bromide appear to be on the order of 1 mg/L, which corresponds to degradation of approximately 1,200 µg/L of EDB- much more than was observed in aqueous phase measurements during the pilot test." NMED Comment: Since the notable increase occurred when an analytical laboratory was changed, the data generated from the new laboratory may or may not be accurate. Even if the analytical method is consistent and the new laboratory is certified for the analysis, the observed increase may potentially be caused by changes associated with various differences among laboratories. The samples should have been analyzed by two independent certified laboratories to confirm the results. Incorporate this measure when an analytical laboratory is to be changed during the course of periodic groundwater monitoring and sampling in the future. No revision required.	Comment noted. No revisions will be made to the text. Closure of the analytical laboratory was not anticipated during the course of the study. Duplicative laboratory analysis was not required in the NMED-approved work plan. The replacement laboratory met all project data quality objectives.
49. Section 4.5.2, EDB, Carbon Isotope Analysis of EDB, page 4-22 Permittee Statement: "As EDB degrades, its carbon (C) stable isotope composition can change as EDB with a heavy C isotope substitution (^{13}C) degrades slightly slower than EDB with only ^{12}C (Koster van Groos et al, 2018)." NMED Comment: Provide information regarding the difference in degradability of EDB with ^{12}C and ^{13}C in the revised Report. Additionally, according to Figure 38, EDB $\delta^{13}C$-Shallow Wells, EDB $\delta^{13}C$ values notably increased in groundwater samples collected from wells KAFB-106MW2-S and KAFB-106064 prior to Phase 2 of the pilot test, in which biostimulation was initiated. Provide an explanation for whether the occurrence of abiotic degradation (e.g., hydrolysis, oxidation) can also increase the fraction of ^{13}C EDB in the revised Report.	The reference provided in the Report (Koster van Groos et al, 2018) discusses biological and abiotic isotope effects associated with EDB degradation. The will be revised to indicate that relative differences in ^{12}C and ^{13}C degradation rates are less than 4%, and that both biological and abiotic degradation result in isotope fractionation. The Report will also be updated to specifically identify the shift in isotope composition at wells KAFB-106064 and KAFB-106MW2-S noted in the NMED comment and will share that this increase was consistent with the decrease observed in EDB at the same locations. Further, the Report will be revised to indicate that while isotope information itself only provides evidence of degradation and not the mechanism, the shift in isotope composition was likely a biologically facilitated process due to the relative speed and other lines of evidence noted during the pilot test.

50. Section 5.1, Conclusions, pages 5-1 and 5-2 Permittee Statements: "Baseline measurements indicated that EDB was likely degrading prior to the pilot test." and, "ISB appears to be a promising approach targeting EDB source areas in Kirtland AFB groundwater. While debromination may be occurring at Kirtland AFB without additional support, the addition of biostimulation amendments and mixing of water appeared to enhance reductive debromination." NMED Comment: The degradation of hydrocarbon constituents (e.g., benzene and toluene) appeared to be hindered by the amended carbon substrates (see Comment 46). The pilot test demonstrated in-situ anaerobic biodegradation of EDB in the most pilot test wells; however, future remediation must focus on the abatement of LNAPL. Once the LNAPL plume is delineated and remediated, EDB levels will likely reduce naturally. The vertical and lateral extent of LNAPL must be investigated (see Comment 30).	It is not clear which data appear to indicate that benzene or toluene degradation is hindered by lactate addition. Please refer to response to Comment #46. The comment further discusses the need for addressing NAPL at the site, which is outside the scope of the pilot test. Please refer to Attachment 2 for scope of the pilot test and separate efforts to evaluate and delineate the vertical and lateral extent of NAPL. No revisions will be made to the text.
51. Figure 9, Fluoroscein [sic] Concentrations -Shallow Wells NMED Comment: The tracer concentrations in injection well KAFB-106IN1 are depicted below 10 ug/L during the baseline, Phase 1 Tracer Test, and Non-pumping Passive Phase according to Figure 9. Section 4.2.1, Tracer Distribution During Phase 1, page 4-2, states that three measurements of fluorescein concentrations of injected water collected directly from the KAFB-l06IN1 sample port averaged 570 µg/L during the 24 hours of tracer injection, while background concentrations were not detected. The data presented in the figure is therefore not accurate. Revise the figure to show that the tracer concentration in the injection well was 570 ug/L during the injection period.	Data indicated for KAFB-106IN1 are from samples collected by the sample pump located within the well below the injection flow control (Baski) valve, or by bailer after the sample pump no longer functioned. Thus, during the injection process, samples were not collected from the KAFB-106IN1 sampling location. The dotted line connecting data from before and after recirculation periods for KAFB-106IN1 will be removed from Figure 9 to help clarify the issue. The line connecting data from before and after recirculation suggests that interpolation between the two may be appropriate, which it is not.

52. Figure 11, δ^2H Concentrations-Shallow Wells NMED Comment: The δ^2H values of deuterium labeled water in injection well KAFB-106IN1 are depicted between -80‰ and -100‰ during the baseline, Phase 1 Tracer Test, and Non-pumping Passive Phase according to Figure 11. Section 4.2.1, Tracer Distribution During Phase 1, page 4-3, states that three measurements of δ^2H values of the injected water averaged +590‰ during the 24 hours of tracer injection, while background δ^2H values at the test area ranged from -97‰ to -92‰. The data presented in the figure is therefore not accurate. Revise the figure to show that the δ^2H value in the injection well was +590‰ during the injection period.	See response to Comment #51. Similarly, the dotted lines connecting data from before and after recirculation periods will be removed from Figure 11 for KAFB-106IN1.
53. Figure 13, Iodide Concentrations - Shallow Wells NMED Comment: The tracer concentrations in injection well KAFB-1061N1 are depicted below 9 mg/L during the Phase 2 and 3 Biostimulation Recirculation, Non-pumping Passive Phase according to Figure 13. Section 4.2.2, Tracer Distribution During Phase 2 and 3, page 4-4, states that iodide results from the injectate ranged from 18 to 26 mg/L. The data presented in the figure is therefore not accurate. Revise the figure to show that the tracer concentration in the injection well was 18 to 26 mg/L during the injection period.	See response to Comment #51. Similarly, the dotted lines connecting data from before and after recirculation periods will be removed from Figure 13 for KAFB-106IN1.
54. Figure 15, Lactic Acid Concentrations -All Wells (Except 1061N1) NMED Comment: The lactic acid concentrations were positively detected in groundwater samples collected from wells KAFB-106MW2-S, KAFB-106MW2-I, KAFB-106MW1-S, and KAFB-106064 prior to Phase 1 Tracer Recirculation according to Figure 15 although lactic acid was not amended to the injection fluid during Phase 1. Provide an explanation for the detections in the revised Report.	The detection of low concentrations of lactic acid in the aquifer prior to amendment is interesting. One explanation is low-level bacterial fermentation of organics in the aquifer and the text has been revised to introduce this possibility. The fermented organics could be petroleum hydrocarbons, bacterial exopolysaccharides (EPS), and/or dead biomass. Such lactate would then be expected to further ferment to acetate and propionate, which were also detected in situ.

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ATTACHMENT 1 TO RTC TABLE

CURRENT WELL DESIGNATIONS

Attachment 1
Current Well Designations

Current Database ID	Previous Database ID (if different)
KAFB-003	KAFB-3, KAFB003
KAFB-015	KAFB-15, KAFB015
KAFB-016	KAFB-16, KAFB016
KAFB-106001	KAFB-1061
KAFB-106002	KAFB-1062
KAFB-106003	KAFB-1063
KAFB-106004	KAFB-1064
KAFB-106005	KAFB-1065
KAFB-106006	KAFB-1066
KAFB-106007	KAFB-1067
KAFB-106008	KAFB-1068
KAFB-106009	KAFB-1069
KAFB-106010	KAFB-10610
KAFB-106011	KAFB-10611
KAFB-106012R	KAFB-10612R
KAFB-106013	KAFB-10613
KAFB-106014	KAFB-10614
KAFB-106015	KAFB-10615
KAFB-106016	KAFB-10616
KAFB-106017	KAFB-10617
KAFB-106018	KAFB-10618
KAFB-106019	KAFB-10619
KAFB-106020	KAFB-10620
KAFB-106021	KAFB-10621
KAFB-106022	KAFB-10622
KAFB-106023	KAFB-10623
KAFB-106024	KAFB-10624
KAFB-106025	KAFB-10625
KAFB-106026	KAFB-10626
KAFB-106027	KAFB-10627
KAFB-106028	KAFB-10628-510
KAFB-106029	No change
KAFB-106030	No change
KAFB-106031	No change
KAFB-106032	No change
KAFB-106033	No change
KAFB-106034	No change
KAFB-106035	No change
KAFB-106036	No change
KAFB-106037	No change
KAFB-106038	No change
KAFB-106039	No change
KAFB-106040	No change
KAFB-106041	No change
KAFB-106042	No change

Attachment 1
Current Well Designations

Current Database ID	Previous Database ID (if different)
KAFB-106043	No change
KAFB-106044	No change
KAFB-106045	No change
KAFB-106046	No change
KAFB-106047	No change
KAFB-106048	No change
KAFB-106049	No change
KAFB-106050	No change
KAFB-106051	No change
KAFB-106052	No change
KAFB-106053	No change
KAFB-106054	No change
KAFB-106055	No change
KAFB-106057	No change
KAFB-106058	No change
KAFB-106059	No change
KAFB-106060	No change
KAFB-106061	No change
KAFB-106062	No change
KAFB-106063	No change
KAFB-106064	No change
KAFB-106065	No change
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KAFB-106069	No change
KAFB-106070	No change
KAFB-106071	No change
KAFB-106072	No change
KAFB-106073	No change
KAFB-106074	No change
KAFB-106075	No change
KAFB-106076	No change
KAFB-106077	No change
KAFB-106078	No change
KAFB-106079	No change
KAFB-106080	No change
KAFB-106081	No change
KAFB-106082	No change
KAFB-106083	No change
KAFB-106084	No change
KAFB-106085	No change
KAFB-106086	No change
KAFB-106087	No change
KAFB-106088	No change

Attachment 1
Current Well Designations

Current Database ID	Previous Database ID (if different)
KAFB-106089	No change
KAFB-106090	No change
KAFB-106091	No change
KAFB-106092	No change
KAFB-106093	No change
KAFB-106094	No change
KAFB-106095	No change
KAFB-106096	No change
KAFB-106097	No change
KAFB-106098	No change
KAFB-106099	No change
KAFB-106100	No change
KAFB-106101	No change
KAFB-106102	No change
KAFB-106103	No change
KAFB-106104	No change
KAFB-106105	No change
KAFB-106106	No change
KAFB-106107	No change
KAFB-106148-484	No change
KAFB-106149-484	No change
KAFB-106150-484	No change
KAFB-106151-484	No change
KAFB-106152-484	No change
KAFB-106153-484	No change
KAFB-106154-484	No change
KAFB-106155-484	No change
KAFB-106156-484	No change
KAFB-106201	No change
KAFB-106202	No change
KAFB-106203	No change
KAFB-106204	No change
KAFB-106205	No change
KAFB-106206	No change
KAFB-106207	No change
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KAFB-106209	No change
KAFB-106212	No change
KAFB-106213	No change
KAFB-106214	No change
KAFB-106215	No change
KAFB-106216	No change
KAFB-106217	No change
KAFB-106218	No change
KAFB-106219	No change

Attachment 1
Current Well Designations

Current Database ID	Previous Database ID (if different)
KAFB-106220	No change
KAFB-106221	No change
KAFB-106222	No change
KAFB-106223	No change
KAFB-106224	No change
KAFB-106225	No change
KAFB-106226	No change
KAFB-106227	No change
KAFB-106229	No change
KAFB-106228	No change
KAFB-106230	No change
KAFB-106231	No change
KAFB-106232	No change
KAFB-106233	No change
KAFB-106234	No change
KAFB-106235-438	KAFB-106235-463
KAFB-106235-472	KAFB-106235-492
KAFB-106235-501	KAFB-106235-521
KAFB-106236-436	KAFB-106236-461
KAFB-106236-470	KAFB-106236-490
KAFB-106236-499	KAFB-106236-519
KAFB-106240-449	No change
KAFB-106241-428	No change
KAFB-106242-418	No change
KAFB-106243-425	No change
KAFB-106244-445	No change
KAFB-106245-460	No change
KAFB-106247-490	No change
KAFB-106S1-447	No change
KAFB-106S2-451	No change
KAFB-106S3-449	No change
KAFB-106S4-446	No change
KAFB-106S5-446	No change
KAFB-106S7-491	No change
KAFB-106S8-491	No change
KAFB-106S9-447	No change
KAFB-3411	KAFB3411
ST106-VA2	VA HOSPITAL WELL

ATTACHMENT 2

SCOPE OF EDB ISB PILOT TEST

Attachment 2 –Scope of EDB ISB Pilot Test

Pilot Test Scoping and Development

In 2013, Department of Defense's (DoD) Environmental Security Technology Certification Program (ESTCP) funded a demonstration project (ER-201331) to better understand natural attenuation of 1,2-dibromoethane (EDB) and the potential to enhance EDB biodegradation. Multiple DoD sites were considered for the demonstration and ultimately Kirtland Air Force Base (AFB) was selected based on its history of EDB groundwater contamination. Separately, a Treatability Study Work Plan was submitted to the New Mexico Environment Department (NMED) on May 2, 2014 and NMED approval was received via email communication on May 7, 2014 (Blaine, 2014). Microbial community analyses and bench-scale treatability studies were performed using Kirtland AFB soils and groundwater, and the results indicated that *in situ* bioremediation (ISB) showed promise for enhancing EDB biodegradation at Kirtland AFB, either through biostimulation of native debrominating organisms or through bioaugmentation with an exogenous debrominating culture (e.g., SDC-9).

Results of these studies were presented to the NMED and the Bulk Fuels Facility (BFF) Biogeochemistry/LNAPL Technical Working Group (TWG)[1] in May 2015 (Hatzinger, 2015). This presentation also proposed the demonstration of *in situ* EDB biodegradation through a single-well bio-sparging test funded through ESTCP project ER-201331. In response to a request from NMED's Chief Scientist, the Air Force agreed to expand the scope of the pilot test to provide more meaningful results regarding ISB of EDB. A conceptual pilot test memo (white paper; KAFB, 2015) was provided to NMED in July 2015, and the pilot test was discussed at an August 2015 meeting of the LNAPL/Biogeochemical TWG. NMED's Chief Scientist concurred with the conceptual approach and requested that the Air Force seek funding for the pilot test. The ESTCP contracting office was unable to process the request to expand the scope of the pilot test prior to the funding expiration date, but funding of the effort was successful through an alternate contract vehicle in September 2015 (USACE Rapid Response).

With the exception of isotope analyses performed with ESTCP funding, the proposed expanded pilot test was funded through the USACE Rapid Response contract. Discussions regarding the scope and design of the pilot test continued for another year and included a presentation in April 2016 to the Biogeochemistry/LNAPL TWG of a nearly complete design (Koster van Groos, 2016). Suggested changes by NMED, including the request for nested monitoring wells that included both shallow and intermediate wells, were incorporated into the final pilot test design. The *Ethylene Dibromide In Situ Biodegradation Pilot Test Work Plan* (Work Plan; KAFB, 2016a) was submitted to NMED for review in October 2016.

As described in the Work Plan (KAFB, 2016a), the scope of the pilot test was to investigate anaerobic ISB of EDB:

> *The primary objective of this pilot test is to evaluate the extent to which potential treatment amendments for in situ biostimulation and bioaugmentation enhance anaerobic EDB*

[1] The Biogeochemistry/LNAPL TWG was involved in the development of the scope of work for the ISB Pilot at the direction of NMED's Chief Scientist. The TWGs established for the BFF project are not required by Kirtland AFB's Hazardous Waste Treatment Facility Operating Permit (HWTF Permit No. NM9570024423) and no formal minutes are kept by either NMED or the Air Force. TWGs are part of the stakeholder engagement program for BFF and are solely advisory. All regulatory decisions regarding work plan scope, well construction, and other issues were made solely by NMED.

> *biodegradation processes. Evaluation of the test will be completed through a comprehensive groundwater sampling regimen that assesses direct and indirect indicators of EDB biodegradation. This pilot test is primarily designed to inform whether the proposed amendments can stimulate enhanced anaerobic EDB biodegradation. Information regarding the distribution of amendments in the subsurface will be collected primarily to aid interpretation of biodegradation effectiveness, but may provide some insight into how similar systems may be scaled up for larger scale bioremediation treatments.*

NMED Involvement and Approvals

As the regulator, NMED was actively involved throughout the pilot test, from its conception, design, and work planning, through field activities, and most recently with evaluation of results in the Report. A timeline of approved documents and permits is summarized below, as well as a discussion of NMED's involvement during field activities.

The design and installation methods of the pilot test system, the phased approach to system operation, and the associated sampling plan were discussed at various stages (Hatzinger, 2015; Koster van Groos, 2016) and reviewed by the NMED in the Work Plan (KAFB, 2016a). NMED approved the Work Plan with conditions in a letter dated December 12, 2016 (NMED, 2016a), which also recognized the scope of the pilot test scope:

> *The work plan addresses activities to be performed at the Bulk Fuels Facility (BFF) site to evaluate the extent to which potential treatment amendments enhance anaerobic ethylene dibromide (EDB) biodegradation processes.*

As requested, responses to the seven conditions listed in the approval letter, along with a revised Work Plan, were provided to NMED within 30 days of receipt on December 22, 2016. No further comments were received from NMED.

Prior to submitting the Work Plan (KAFB, 2016a), a Notice of Intent to Discharge was submitted to the NMED Ground Water Quality Bureau on November 7, 2016 (KAFB, 2016b). It was determined that a discharge permit would not be required for injection and recirculation activities associated with the pilot test, as stated in the NMED letter dated December 16, 2016 (NMED, 2016b).

During well installation, lithologic logs were sent to NMED for review. Additionally, the final design for each well was provided to NMED for review and approval prior to the start of well construction. NMED also signed off on all well construction details for the newly installed groundwater monitoring, extraction, and injection wells. Throughout the pilot test, NMED and stakeholders were briefed regarding the test at various Stakeholders Meetings held in January, March, and June 2018. Weekly updates were also sent to NMED via email to summarize all field activities.

Light non-aqueous phase liquid (LNAPL) was discovered during pump installation at groundwater monitoring well KAFB-106MW1-S in September 2017. NMED was notified, as outlined in the Work Plan (KAFB, 2016a) and a meeting was held in September 2017. In an email correspondence sent on September 25, 2017 (NMED, 2017), NMED communicated that it had no concerns or remaining questions regarding the start of Phase 1 of the pilot test.

After evaluation of Phase 2 data, it was evident that the rate of anaerobic biodegradation of EDB was significantly enhanced as a result of biostimulation and that bioaugmentation was not warranted at that time. As a result, Kirtland AFB submitted the Phase 3 EDB ISB Pilot Test Notification Letter (KAFB, 2018) to NMED, which outlined a revised plan for the third phase (Phase 3) of the pilot test. The modified Phase 3 (i.e.: continued biostimulation rather than bioaugmentation) was previously agreed upon during a technical meeting among representatives from NMED, the Secretary of the Air Force's office, the Air Force Civil Engineer Center, APTIM and USACE on June 7, 2018. NMED approved the Phase 3 EDB ISB Pilot Test Notification Letter with two conditions in a letter dated August 7, 2018 (NMED, 2018). The conditions included scheduling a TWG meeting to review pilot test results and discuss the deferral of bioaugmentation and that bioaugmentation should remain as an approved, but deferred, component of the pilot test. A biogeochemistry TWG meeting was held on September 17, 2018 to give an update on pilot test results to date and discuss the deferral of bioaugmentation. During that TWG meeting most participants agreed that bioaugmentation was not warranted.

LNAPL Delineation and Additional Work

Numerous comments in the Notice of Deficiency indicate that the ISB Pilot Test did not adequately consider LNAPL in the source area. As noted above, the NMED-approved scope was focused on the evaluation of the anaerobic biodegradation of EDB. Measurement of LNAPL, if any was observed, was intended to help inform the evaluation of EDB ISB and was not a separate study objective. In fact, measurable LNAPL was not expected at the pilot test location, as noted in the NMED-approved Work Plan:

> *LNAPL is not expected in the area of the pilot test, as LNAPL has not been measured (or determined by sheen) in groundwater monitoring wells in the test area or immediately upgradient since Q4 2011. It is also noted that LNAPL was not observed at wells in this area prior to the submergence of the top of screen at KAFB-106064 (a total of 12 quarterly measurements between Q1 2012 and Q4 2014; screen was submerged by Q1 2015). However, newly installed wells will be monitored for presence of LNAPL several days after installation. If LNAPL is observed during well monitoring, a conference call will be initiated among USACE, CB&I, USAF, and the New Mexico Environment Department (NMED) to discuss whether the project should move forward at the planned location.*

As described above, a conference call to discuss observed LNAPL was held in September 2017 and NMED communicated afterwards that it had no concerns regarding the start of the pilot test at the planned location.

The Air Force is addressing the nature and extent of LNAPL through the vadose zone coring that was performed in 2018 and summarized in the October 25, 2019 Source Zone Characterization Report. Additional source area wells will be installed in accordance with the NMED approved Work Plan for *Data Gap Monitoring Well Installation KAFB-106248 to KAFB-106252* (KAFB, 2019) to address the problem of continued water table rise and to further delineate the EDB and benzene plumes. Soil coring will also be performed as part of this field effort. The proposed wells will be gauged for LNAPL, and thickness reported to NMED in Quarterly Monitoring Reports. Long-term or larger-scale viability of anaerobic ISB for EDB can be evaluated together with all appropriate alternatives as larger scale and more comprehensive remedies are considered at the site.

References

Blaine, 2014. Email correspondence from Tom Blaine (NMED) and Mike Amdurer (CB&I Federal Services LLC). May 7, 2014.

Hatzinger, P., 2015. "Results from Laboratory Microcosm Studies and Microbial Community Analysis." May.

Koster van Groos, P., 2016. "ESTCP Project Meeting: EDB Recirculation Pilot Test Work Plan." April.

NMED, 2016a. December 12, 2016 correspondence from Ms. Kathryn Roberts, Director, Resource Protection Division, to Colonel Eric H. Froelich, Base Commander, 377 ABW/CC, Kirtland AFB, NM and Mr. John Pike, Director, Environmental Management Services, 377 MSG, Kirtland AFB, NM, *re: Ethylene Dibromide In Situ Bioremediation Pilot Test Work Plan, Bulk Fuels Facility, Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, EAP ID# NM9570024423, HWB-KAFB-13-MISC*.

NMED, 2016b. December 16, 2016 correspondence from Ms. Michelle Hunter, Chief, Ground Water Quality Bureau, to Colonel Dawn A. Nickell, Vice Commander, 377 ABW/CV, Kirtland AFB, NM, *re: Response to Notice of Intent to Discharge, Ethylene Dibromide In-Situ Biodegradation Pilot Test Work Plan, Discharge Permit Not Required to Inject Specific Tracers and Amendments*. December.

NMED, 2017. Email correspondence from Diane Agnew (NMED) to Brian Renaghan (AFCEC) et al. September 25, 2017.

NMED, 2018. August 7, 2018 correspondence from Mr. Juan Carlos Borrego, Deputy Secretary, Environment Department, to Colonel Richard W. Gibbs, Base Commander, 377 AB/CC, Kirtland AFB, NM and Mr. Chris Segura, Chief, Installation Support Section, AFCEC/CZOW, Kirtland AFB, NM, *re: Phase 3 Ethylene Dibromide In Situ Biodegradation Pilot Test, Notification letter, Bulk Fuels Facility, Solid Waste Management Unit ST-106/SS-11, Kirtland Air Force Base, EPA ID# NM9570024423, HWB-KAFB-13-MISC*.

KAFB, 2015. *Technical Memorandum for a Conceptual Pilot Test – Enhanced Anaerobic Bioremediation of EDB*. July.

KAFB, 2016a. *Ethylene Dibromide In Situ Biodegradation Pilot Test Work Plan, Bulk Fuels Facility, Kirtland Air Force Base, New Mexico*. Prepared by CB&I Federal Services, LLC. for the USACE Albuquerque District under USACE Contract No. W9128F-12-D-0003, Task Order 0025. December.

KAFB, 2016b. *New Mexico Environment Department Ground Water Quality Bureau Notice of Intent to Discharge*. October 26.

KAFB, 2018. *Phase 3 Ethylene Dibromide In Situ Biodegradation Pilot Test Notification Letter, Bulk Fuels Facility, Kirtland Air Force Base, New Mexico*. July.

KAFB, 2019. *Work Plan for Data Gap Monitoring Well Installation KAFB-106248 to KAFB-106252, Bulk Fuels Facility, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, New Mexico*. December.

Common Comment and Response Worksheet (Version 3)

Date	Reviewer		Document Title (version)	Contract/TO Number
7/11/2020	NMED HWB		Quarterly Monitoring Report for April-June 2019 Bulk Fuels Facility Solid Waste Management Units ST-106/SS-111 Kirtland Air Force Base, New Mexico	NMED Permit No. NM9570024423 USACE Contract No. W912DR-12-D-0006
Item	**Section**	**Page**	**Comment**	**Response**
1	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **a.** The response to NMED's comments must be included as Appendix A of each document revision.	Acknowledged. The response to NMED's comments are included as Appendix A-2 beginning with the Q2 2020 Quarterly Report and going forward.
2	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **b.** All field methods for the project must be documented in an appendix, as required by Permit Section 6.2.4.4.11. The documentation must be specific to each monitoring activity, such as soil vapor monitoring, groundwater monitoring, or operation and maintenance of the groundwater treatment system. References to quality assurance project plans (QAPPs), standard operating procedures (SOPs), or work plans are not acceptable. All deviations from approved work plans must be discussed and explained in a Deviations section.	Acknowledged. Field methods for the project, including a Deviations section for each activity, are included as Appendix B-1 beginning with the Q3 2020 Quarterly Report and going forward.
3	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **c.** Wells must be consistently referred to by the same name/designation in all periodic reports, sections of the text, tables, and figures. The designations must match those provided in the digital analytical data files.	Acknowledged. Wells are referred to consistently throughout this document. A table listing any historical changes to well designations that can be used for cross reference purposes is provided as Appendix B-2 beginning with the Q3 2020 Quarterly Report and going forward.
4	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **d.** Sampling data tables must include the practical quantitation limit (PQL) and listed laboratory report detection limit (RDL) for each analysis.	Acknowledged. Since this project is being performed under a DoD contract, the laboratory is required to use specific DoD Quality Systems Manual (QSM) reporting limit nomenclature when reporting data. However, the DoD nomenclature is comparable to EPA method reporting nomenclature. To clarify, beginning with the Q2 2020 report and going forward, an analytical data Excel flat file is being provided in an appendix with each sample matrix type to include the PQL (LOQ per DoD), RDL (LOD per DoD) and MDL (DL per DoD). See response to comment 8 below.
5	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **e.** Sampling data tables must include the appropriate screening levels for data comparison.	Acknowledged. Sampling data tables will include the relevant appropriate screening levels.

Item	Section	Page	Comment	Response
6	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **f.** Analytical data tables in digital format must include a column that indicates which analytical data report the specific sample information can be found. This link must correspond to the analytical data report file name.	Acknowledged. Analytical data flat files in Excel are being provided in the appendices (see response to comment 8 below) and include a column which identifies the analytical laboratory data report file name where the specific sample information can be located.
7	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **g.** Data quality exceptions, such as when the PQL exceeds the corresponding screening level, must be identified as such in all tables and figures (see Permit Section 6.5.18).	Acknowledged. Exceedances of the PQL are provided in the sortable, searchable Excel tables provided as Appendices in the Q2 2020 report and future reports (see response to comment 8 below). Beginning in the Q3 2020 quarterly report, a discussion and table of PQL exceedances above the corresponding screening level where the analytical result is estimated (J-flagged) are included in the Data Quality Evaluation Report appendices to the Quarterly Report. The exceptions will also be noted on figures.
8	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **h.** Analytical data provided in digital format such as Microsoft Excel or Access files must be provided in a sortable, searchable format. Previous reports have provided digital data in the same format as the printed tables. These tables are not sortable or searchable. Provide the tables in a standard database format.	Acknowledged. Beginning in the Q2 2020 quarterly report and going forward, analytical data tables provided as appendices will be provided in a sortable, searchable standard database format (Excel). The tables being provided can be found in: Appendix D-3: Soil Vapor Analytical Data (Q2 and Q4 reports only) Appendix F-4: Groundwater Analytical Data Appendix H-3: Drinking Water Supply Well Analytical Data Appendix I-6: Groundwater Treatment System Performance Analytical Data
9	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **i.** Analytical data packages must be submitted in accordance with KAFB Permit Section 6.5.18.2, Laboratory Deliverables.	Acknowledged. Beginning in the Q3 2020 quarterly report and going forward, EPA Level II data packages will be provided with the report, and Levels III and IV will be maintained and available to NMED upon request (see response to Item 20 below).
10	General Comments	1	**1. Monitoring Report Contents** **NMED Comment:** Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable**:** **j.** All tables, figures, and appendices must be appropriately numbered and titled.	Acknowledged. Tables, figures, and appendices will be appropriately numbered and titled in this document. Headers and footers with appropriate page numbering and titles will be applied to all figures, tables, and appendices.
11	General Comments	1	**1. Monitoring Report Contents** **NMED Comment**: Based on the issues identified in this report and other periodic reports, NMED is providing the following reporting requirements which the Permittee must incorporate into future reports. Permittee is required to include the following as applicable: **k.** Every page of every submittal, including all pages within all sections and appendices, must be numbered either sequentially or in some other format acceptable to NMED.	Acknowledged. See response to item 10 above.

Item	Section	Page	Comment	Response
12	General Comments	2	**2. Analytical Data Detection and Quantitation Limits** **NMED Comment:** (Paragraph 1) Many of the analytical data tables presented in the Report list the limit of detection (LOD) for each sample analysis, however, it is not clear if this value represents the laboratory method detection limit or reporting detection limit. Some tables list the LOD and some the limit of quantification (LOQ). The permittee must provide the method detection limit (MDL) in the data tables. In addition, the Permittee must include the reporting detection limit (assuming this is the Permittee's "LOD") and the PQL (assuming this is the Permittee's "LOQ") for each sample analyzed in the data tables.	Acknowledged. As noted in Comment 4 above, the required laboratory reporting is per contract required DoD QSM reporting requirements. For clarification, the DoD DL is equivalent to the EPA MDL; the DoD LOD is equivalent to the EPA RDL; and the DoD LOQ is equivalent to the EPA PQL. To further clarify this, we have included an analytical data Excel flat file in an appendix with each sample matrix type to show the specific PQL, RDL and MDL for each sample analyte.
13	General Comments	2	**2. Analytical Data Detection and Quantitation Limits** **NMED Comment:** (Paragraphs 2 and 3) The Permittee's Quality Assurance Project Plans (QAPPs) indicate that the Permittee is using three different variations of terminology for method reporting limits, including one which seems to be backwards. The Permittee's QAPP for Vadose Zone Treatability Studies Attachment 1, Tables 1-1a, Method Reporting Limits – Drinking Water, 1-1b, Method Report Limits – Soil and Investigation Derived Waste, and 1-1c, Method Reporting Limits – Volatile Organic Compounds in Air, all seeming use the LOQ appropriately (as the PQL), but there is a lack of consistency between the method detection limit and reporting detection limit. In Table 1-1a, Drinking Water, "MDL" appears to equate to the method detection limit, and "LOD" appears to equate to the reporting detection limit. In Table 1-1b, Soil, "LOD" appears to equate to the method detection limit and "DL" appears to equate to the reporting detection limit. Based on the fact that the PQL must be greater than the reporting detection limit and the reporting detection limit must be greater than the method detection limit, Table 1-1b, Soil, appears to be wrong. NMED is assuming that similar tables appear in the QAPP for quarterly monitoring.	Acknowledged. The Vadose Zone Treatability QAPP includes method reporting limit tables for TestAmerica, Inc. laboratories for drinking water, soil coring and investigation derived waste, and for soil vapor. It appears on the reporting limit table 1-1b, Soil, the values in the LOD and DL columns were inadvertently switched. It is correct that the LOQ/PQL is greater than the LOD/RDL which is greater than the DL/MDL. The reporting limit tables in the QAPP for the Dissolved-Phase Plume and Groundwater Treatment System Design (quarterly groundwater monitoring), Attachment 1 (Eurofins Lancaster Laboratories) are confirmed to be correct.
14	General Comments	2	**2. Analytical Data Detection and Quantitation Limits** **NMED Comment:** (Paragraph 4) These issues [items 12 and 13 above] cause confusion for the reviewer, community stakeholders, and the public, and increases the time required to review submittals from the Permittee. The Permittee must use appropriate and consistent terms for Quality Assurance/Quality Control in all periodic reporting submittals and for all media (e.g., use MDL consistently instead of DL). While NMED does not review or approve QAPPs, the Permittee must assure that they are providing their contractors with the appropriate information to provide appropriate, consistent, and accurate information to NMED. Consistency in reporting by the Permittee will reduce both agency and Air Force internal review times.	Acknowledged. See responses to items 12 and 13 above.
15	Specific Comments	2/3	**3. Table of Contents, Appendix B, page iv:** **NMED Comment:** Appendix B, New Activities Supporting Information, contains well completion reports for four new wells installed and developed in accordance with the NMED-approved 2017 Work Plan for Vadose Zone Coring, Vapor Monitoring, and Water Supply Sampling. KAFB Permit Section 6.2.2.1.2, Site Investigations – Investigation Reports, and Section 6.2.4.3, Reporting Requirements – Investigation Reports, require that the information and data collected from all investigation activities conducted during the quarter be submitted to NMED as separate, stand-alone reports. The Permittee must submit individual reports for all investigation activities conducted in support of the ongoing investigation of the Bulk Fuels Facility spill, rather than submit the information as appendices in quarterly reports.	Acknowledged. This information was also requested by the NMED to be included in the Source Area Characterization Report based on the comments received for the report. Discussions with NMED will be held to determine the preferred data submittal method.

Item	Section	Page	Comment	Response
16	Specific Comments	3	**4. Section 2.5 Q2 2019 Soil Vapor Data, page 2-4:** **Permittee Statement:** "The RCRA permit does not specify cleanup levels for soil vapor. The quarterly reports are not intended to assess risk; the vapor data are used to assess concentration trends. The risk assessment (USACE, 2017e) compares vapor concentrations to the vapor intrusion screening levels in the NMED Risk Assessment Guidance for Site Investigations and Remediation. All EDB and benzene concentrations are compared against 3,800 and 3,200 micrograms per cubic meter (µg/m3), respectively. HC concentrations are compared against 1,000 parts per million by volume (ppmv). The comparison concentrations used in this report were determined by historical maximum and minimum soil vapor results to show which WVMPs had relatively high or low concentrations." **NMED Comment:** The Permittee must clarify if the comparison values for EDB, benzene, and HC represent the historical maximum or minimum, or some other calculated value so that changes relative to the values can be evaluated. The Permittee must also provide a reference for the historical soil vapor values. The Permittee accurately states that quarterly reports are not intended to assess risk; however, the Permittee must provide a comparison of detected concentrations to a regulatory standard for the purpose of assessing the presence and location of contaminants of concern. NMED's Risk Assessment Guidance for Site Investigations and Remediation (2019 and as updated) vapor intrusion screening levels (VISLs) must be used a first-tier screening assessment.	Acknowledged. In the Q2 2020 report, language was revised to clarify that the comparison values were set based on a qualitative analysis of soil vapor data in Q2 2016 to help the reader distinguish areas of relatively high or low soil vapor concentrations (Section 2.3). They are not intended to be screening levels, rather their purpose is as a helpful tool for the reader to evaluate trends. While the vapor intrusion screening levels may be an appropriate first-tier screening assessment for the shallowest soil vapor samples (ie, up to 25 ft bgs), they are less appropriate deeper in the vadose zone where there are not vapor intrusion pathways to the ground surface. It is respectfully requested that a teleconference be scheduled with the NMED to discuss relevant regulatory standards against which to screen soil vapor lower than the 25-ft bgs soil vapor monitoring points. Appropriate screening levels will be incorporated in future monitoring reports once the levels have been determined for depths greater than 25 ft bgs.
17	Specific Comments	3	**5. Section 2.2. Bioventing Pilot Test, page 2-2** **Permittee Statement:** "A bioventing report will be submitted on January 31, 2020 as requested by NMED in a letter dated February 25, 2019 (NMED, 2019). This report will include data collected up to Q4 2019. Data collected after Q4 2019 will be provided in the relevant quarterly monitoring reports. The Q4 2020 Quarterly and Annual Monitoring Report will include results to date, and the final results of the bioventing pilot test will be provided in the Q4 2021 Quarterly and Annual Monitoring Report." **NMED Comment:** Bioventing pilot test data is collected each quarter; therefore, the Permittee must provide quarterly data updates in separate quarterly status reports specific to the bioventing pilot study to allow NMED to provide timely adjustment and inputs to the bioventing system. The final results of the bioventing pilot test must be submitted as a stand-alone document rather than as an appendix to the Q4 2021 Quarterly and Annual Monitoring Report.	Acknowledged. Future bioventing reports will be removed from quarterly reports. The final results of the bioventing pilot test will be submitted as a stand-alone document.

Item	Section	Page	Comment	Response
18	Specific Comments	3	**6. Section 3.3.1 Sampling Deviations, page 3-3** **Permittee Statement:** "Groundwater samples were not obtained from seven wells in Q2 2019. Three wells (KAFB-106001, KAFB-106008, and KAFB-106079) could not be sampled due to suspected biofouling. These wells will be sampled using passive sampling techniques in the future after well rehabilitation is evaluated." **NMED Comment:** The Permittee must provide additional information in a subsequent quarterly report on suspected biofouling of wells KAFB-106001, KAFB-106008, and KAFB-106079, such as evidence for biofouling, the source of biofouling, and the date when biofouling was first suspected. Well KAFB-106079 is less than 1000 ft from interim measure extraction well KAFB-106239. Provide information on the potential for suspected biofouling at KAFB-106079 to impact KAFB-106239 and the Groundwater Treatment System. The Permittee must also submit a work plan for evaluating and conducting rehabilitation of the three wells. Use of passive sampling techniques for wells KAFB-106001 and KAFB-106079 is contingent upon NMED approval. Because LNAPL was previously detected in well KAFB-106008, use of passive sampling is not appropriate.	Acknowledged. The following additional information on suspected biofouling of wells KAFB-106001, KAFB-106008, and KAFB-106079, along with a discussion of the potential for biofouling at KAFB-106239, is provided only in this response to comments table, as this was not part of Q3 2020 groundwater monitoring activities discussed in the main text of this quarterly report. A similar discussion will be included in future quarterly reports for wells suspected of biofouling during the relevant quarter. During the Q2 2019 groundwater sampling event, the sampling team was unable to purge wells KAFB-106001, KAFB-106008, and KAFB-106079. Sampling was attempted at these three wells on May 1, April 23, and April 26, 2019, respectively. The pumps were removed, and biologic films were observed on the pump screens. The biologic films were thick enough to prevent water from entering the screens. The screens were cleaned, and another attempt to pump was made, however, the biologic material occluded the screens again preventing water from entering the pump. These wells were disinfected in Q3 2019 in accordance with the approved procedures (see paragraph below), and disinfection was reported in the Q3 2019 Quarterly Report. These three wells are located in areas with historically high BTEX concentrations and anaerobic conditions. As discussed in Section 7 of the Phase I RCRA Facility Investigation Report (Kirtland AFB, 2018, *Phase I RCRA Facility Investigation Report, Bulk Fuels Facility Releases, Solid Waste Management Unit ST-106/SS-111*. Prepared by Sundance Consulting, Inc. for Kirtland AFB under USACE-Albuquerque District Contract No. W912PP-16-C-0002. August.), concentrations of microbial indicator compounds suggest that microbial degradation is occurring in this area. KAFB-106239 experiences a periodic decrease in pumping rates, which is an indicator of biofouling. When this occurs, it is disinfected in accordance with approved procedures (see paragraph below), and disinfection is discussed in the relevant quarterly report. Acknowledged. Standard well disinfection procedures were provided in the O&M Plan (Kirtland AFB. 2016. Operations and Maintenance Plan, Groundwater Treatment System, Bulk Fuels Facility, SWMUs ST-106/SS-111, Kirtland Air Force Base, New Mexico.), which was approved by NMED in a letter dated December 12, 2016 (Correspondence from Kathryn Roberts, Director, Resource Protection Division to Colonel Eric H. Froehlich, Base Commander, Kirtland AFB, New Mexico, and MR. John Pike, Director, Environmental Management Division, 377 MSG, Kirtland AFB, New Mexico, re: Operation and Maintenance Plan, Groundwater Treatment System, Bulk Fuels Facility Solid Waste Management Units ST-106/SS-111, Kirtland Air Force Base, EPA ID No. NM9570024423, HWB-KAFB-13-

				MISC.) Disinfection of these wells took place in September, 2019 and was reported on in the Q3 2019 quarterly report. Acknowledged. Wells KAFB-106001, KAFB-106079, and KAFB-106008 will be sampled using portable pumps in future monitoring quarters until such time as passive sampling is approved by NMED.
19	Specific Comments	4	**7. Section 3.6.1.1 EDB Analytical Results, page 3-5** **Permittee Statement:** "Five EDB exceedances were from wells north of Ridgecrest Drive SE but none were north of Gibson Boulevard SE." **NMED Comment:** Figures 3-5 and 3-6 present EDB concentrations in groundwater for reference elevation 4857 and 4838, respectively. Both figures depict the northern extent of the EDB plume as being north of Gibson Boulevard SE. The Permittee must revise the statement and figures for accuracy if they are included in future periodic reports.	Acknowledged. This statement was verified as accurate. While some wells north of Gibson Boulevard SE had EDB detections, there were no EDB exceedances above the EPA MCL of 0.05 µg/L in wells sampled north of Gibson in Q2 2019. Because some of the wells with exceedances were immediately south of Gibson, interpolation of the plume boundary shows the northern boundary extending approximately 100 ft to the north of Gibson. However, no wells located north of Gibson are included within the plume boundary.
Date	**Reviewer**		**Document Title (version)**	**Contract/TO Number**
9/2/2020	**NMED HWB**		**Reporting Requirements for All Document Submittals** **Kirtland Air Force Base, New Mexico** **EPA ID # NM6213820974** **HWB-KAFB-20-MISC**	**NMED Permit No. NM9570024423** **USACE Contract No. W912DR-12-D-0006**
The following items address comments provided in the September 2, 2020 letter that were not addressed in the by the July 11, 2020 letter.				
Item	**Section**	**Page**	**Comment**	**Response**
20	Letter	2	**1. Laboratory Deliverables:** Section 6.5.18.2, Laboratory Deliverables, of the KAFB Resource Conservation and Recovery Act (RCRA) Permit (KAFB Permit), states the requirements for analytical laboratory reporting. The section states, "[l]aboratory analytical data packages shall be prepared in accordance with EPA-established Level III or IV analytical support protocols." The final paragraph of the permit section goes on to state, "[t]he Permittee shall present summary tables of these data and Level II QC results to the Department in reports or other documents prepared in accordance with Permit Section 6.2.4. Raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory supporting data for samples from this project, shall be compiled and kept on file at the Facility for reference. The Permittee shall make all data available to the Department upon request." Therefore, for purposes of reporting, Level II Qc results are necessary. Level III and IV data must be maintained by the Permittee to be made available upon request.	Acknowledged. This comment clarifies Item 9 above. Beginning with the Q3 2020 Quarterly Report and going forward, Level II rather than Level IV data packages will be provided with the report, and Level III and Level IV will be available upon request.

21	Letter	2	**2. General Guidelines:** NMED has included an attachment titled *General Reporting Guidelines* that provides guidance regarding its expectations of submittals to the Hazardous Waste Bureau. The Permittee must consult the guidance during document preparation.	Acknowledged. Section 4 of the *General Reporting Guidelines*, Periodic Monitoring Report, was consulted during the preparation of the Q3 2020 Quarterly Report, and revisions were made as discussed in Items 22 and 23 below.
22	General Reporting Guidelines	17	**Section 4.11 Tables** The following tables must be included, as applicable: **b**. a table summarizing groundwater and vadose zone fluid elevations, and depths to water data; the table must include the monitoring well depths, casing elevations, the screened intervals in each well, and the dates and times of measurements.	Acknowledged. Beginning in Q3 2020, Table 3-2, Groundwater Elevation and Light Non-Aqueous Phase Liquid Thickness, will be revised to include well depth, bottom of screen, and measurement times. The other required information, including top of screen, is already present in the table.
23	General Reporting Guidelines	17	**Section 4.11 Tables** The following tables must be included, as applicable: **e.** a table summarizing field measurements of groundwater and vadose zone fluid quality data (including historical water quality data as described above).	Acknowledged. A table summarizing field measurements, including historical water quality data, will be added to Appendix E-3. In Q2 and Q4, a table summarizing field measurements from the current sampling event will continue to be provided (Table 3-5 in the Q2 2020 report).

APPENDIX B-1

Field Methods

LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
AFB	Air Force Base
CFR	Code of Federal Regulations
DMS	dual membrane sampler
DO	dissolved oxygen
ft	foot/feet
GWM	groundwater monitoring
GWTS	groundwater treatment system
IDW	investigation-derived waste
LNAPL	light non-aqueous phase liquid
ORP	oxidation reduction potential
PID	photoionization detector
psi	pound(s) per square inch
Q3	third quarter
RCRA	Resource Conservation and Recovery Act

B-1. FIELD METHODS

1. FIELD EQUIPMENT USED IN MULTIPLE SETTINGS

1.1 HEADSPACE

Headspace air quality measurements are collected each time a groundwater monitoring (GWM) well is opened to ensure a safe working environment. Headspace is monitored using a photoionization detector (PID) reading total volatile organic compounds in parts per million volume. While it is in use, each PID is calibrated in accordance with the manufacturer's instructions weekly and bump tested daily. If the results of the bump test fall outside of the accepted range, the instrument is calibrated.

1.2 WATER QUALITY

Water quality measurements are collected as part of multiple sampling events, including GWM, drinking water production well monitoring, and sampling at the groundwater treatment system (GWTS). A multiparameter meter equipped with both a flow-through cell and a sample cup for use in various settings is used to measure temperature, dissolved oxygen (DO), specific conductance, pH, and oxidation-reduction potential (ORP). While it is in use, each multiparameter meter is calibrated in accordance with the manufacturer's instructions weekly and bump tested daily. If the results of the bump test fall outside of the accepted range, the instrument is calibrated. A separate turbidimeter is used to measure turbidity. While it is in use, the turbidimeter is calibrated quarterly and bump tested weekly. If the results of the bump test fall outside of the accepted range, the instrument is calibrated.

1.3 LIQUID LEVELS

Liquid levels are measured using an oil-water interface probe of appropriate lengths based on historical water levels. Individual interface probes are dedicated to a group of wells with similar historical analytical results to reduce the risk of cross-contamination. In addition, interface probes are cleaned between wells to further minimize the risk of cross-contamination.

2. METHODS USED IN MULTIPLE SETTINGS

2.1 OPENING GROUNDWATER MONITORING WELLS

GWM wells are opened during synoptic gauging, groundwater sampling, and in conjunction with other periodic activities as needed (i.e., well rehabilitation). Field teams don personal protective equipment appropriate to the task prior to opening well vaults, remove the bolts, and carefully set the vault lid to the side. In wells that do not contain dedicated equipment, the well cap will be unscrewed and set to the side. In wells that do contain dedicated equipment, the stopper will be removed from the drop pipe and set to the side. The PID will be used to determine the total volatile organic compounds at the top of the well to ensure a safe working environment. If the headspace reading is greater than 5.0 parts per million by volume in the breathing zone, fieldwork at that location is conducted using an air purifying respirator.

2.2 LIQUID LEVELS

Liquid levels are measured during the synoptic gauging event, in conjunction with groundwater sampling as needed, and in conjunction with other period activities as needed (i.e., well rehabilitation). Interface probes are decontaminated prior to use. The interface probe is deployed in the well, and depth to light non-aqueous phase liquid (LNAPL) (if applicable) and water is measured to the individual well's measuring reference point, the top of the well vault, using a straight edge placed across the vault.

2.3 SHIPPING ON ICE

Samples are shipped in coolers with ice for groundwater sampling, drinking water sampling, and GWTS sampling. If the cooler has a spout, it is duct taped shut. The cooler is then lined with two plastic bags. Samples are surrounded by ice in the interior bag, and temperature blanks and trip blanks are included as required. The bags are then sealed shut, chain-of-custody forms attached to the lid within a sealed plastic bag, and the cooler is sealed using packing tape with custody seals attached on opposing corners. Samples are shipped overnight to ensure arrival at the lab at the required temperature.

2.4 FIELD PARAMETER MEASUREMENTS

2.4.1 Field Parameter Measurements Using a Flow-Through Cell

Field parameters are measured using a flow-through cell for GWM low-flow sampling and monthly GWTS sampling. The multiparameter meter probe is placed into the flow-through cell, and purge water enters the cell through the bottom and exits through the top into the required sample container to be held in the appropriate investigation-derived waste (IDW) yard pending disposal at the GWTS or analysis, depending on the historical analytical results from the sample location. The multiparameter meter displays instantaneous measurements that update as the chemistry of the water flowing through the cell changes. Data are recorded on a field form at the frequency required for the activity.

2.4.2 Field Parameter Measurements Using a Sample Cup

Field parameters are measured using a sample cup for drinking water sampling and in conjunction with other periodic activities as needed (i.e., well development). The sample cup is filled from the sampling port, and the multiparameter meter probe is inserted into the sample cup. Once the readings stabilize, they are recorded on a field form.

3. SOIL VAPOR SAMPLING

3.1 EQUIPMENT

Soil vapor samples are collected in Summa canisters; each canister has a unique regulator. A sample train consisting of 0.5-inch fluorinated ethylene propylene tubing and a four-way stainless steel Swagelok cross equipped with quick connects is used in coordination with a Horiba Mexa-584L emissions analyzer and a Gast rotary vane pump to purge the well, measure field parameters, and collect the soil vapor sample. While in use, the Horiba Mexa-584L is calibrated in accordance with the manufacturer's instructions daily before sampling and bump tested halfway through the day. If the results of the bump test fall outside of the accepted range, the instrument is calibrated. In addition, the instrument may be recalibrated if readings begin to drift, based on the professional judgement of the sampling team. A digital manometer is used to gauge pressure in the well and a PID is used to ensure a safe working environment. The digital manometer does not require field calibration. The Swagelok fittings and tubing assembly undergo a pressure test at the beginning, middle, and end of each day by sealing the assembly, using the pump to apply a vacuum, and using the digital manometer to measure the vacuum pressure over a 10-minute period to confirm that there is no leakage in the assembly.

3.2 METHODS

Upon removing the well cap, the well head is connected to the sample train via a quick connect port. The manometer is added to the system to gauge the initial well pressure and then removed. The well is then purged of a pre-calculated vapor volume based upon the well dimensions; the rotary vane pump controls the purge flow rate. The initial pressure of the Summa canister is recorded.

Once the purge is complete, the field parameters of carbon dioxide, oxygen, and total hydrocarbons are measured by the Horiba and the manometer is used to read the post-purge pressure. Field parameters are recorded on field data sheets and a photo is then taken for documentation. A sample is collected by connecting the Summa canister into the system and filling it to a vacuum pressure within from 0 to -5.0 inches of mercury of vacuum. The final pressure of the Summa canister is recorded on a field form, and the sample is shipped to a laboratory for analysis.

3.3 DEVIATIONS

There were no deviations in third quarter (Q3) 2020 as soil vapor samples are only collected in the second and fourth quarters of each year.

4. SYNOPTIC GAUGING

4.1 METHODS

Depths to groundwater and LNAPL are measured quarterly during a three-day synoptic gauging event. Interface probes are decontaminated between wells. Field forms are used to record the depth to water and LNAPL (if applicable), date, time, and interface probe used. Prior to synoptic gauging, the interface probes designated for use are decontaminated and used to measure depths to water in three GWM wells located south of the source area (KAFB-106027, KAFB-106044, and KAFB-106045) to quantify any measurement difference from a control probe. Over a three-day period, barometric pressure changes at the site can cause water levels in a given well to vary by up to 0.15 feet (ft), even after diurnal variations are taken into account. This was determined by observing the change in water levels due to barometric pressure at three wells during a seven-day background monitoring period prior to aquifer testing at KAFB-106228 (Kirtland Air Force Base [AFB], 2016). Therefore, a measurement difference between probes of up to 0.03 ft, or less than 20 percent (%) of 0.15 ft, is negligible as compared to these naturally occurring changes. If a probe measures greater than 0.03 ft different from the control probe, water levels taken using that probe are corrected by the value of the difference. If a probe consistently measures greater than 0.03 ft different from the control probe, water levels taken using that probe are corrected by the value of the difference. Water levels are compared to the previous quarter and may be re-gauged based on professional judgement.

4.2 DEVIATIONS

Liquid level measurements were not obtained from two wells during the Q3 2020 synoptic gauging event. Depth to water in wells KAFB-106063 and KAFB-106064 was not measured in July due to the presence of dedicated downhole equipment related to the Environmental Security Technology Certification Program pilot test project for ethylene dibromide *in situ* biodegradation. However, water levels were measured prior to sampling in August, and are reported in the Q3 2020 report for informational purposes only, and were not used to contour groundwater elevations.

5. GROUNDWATER SAMPLING

5.1 PASSIVE SAMPLING

5.1.1 Equipment Used

Passive sampling is conducted using dual membrane samplers (DMS) attached to a tether dedicated to the individual well. Each tether is equipped with a series of rings beginning at the top of screen depth and continuing every 2.6 ft, with the lowest ring positioned 2.6 ft above the bottom of the screen. Interface probes and PIDs are also used during passive sampling.

5.1.2 Methods

5.1.2.1 Deployment

Each DMS is deployed a minimum of three weeks prior the planned sampling date. If the screened interval of the well is partially submerged or submerged by less than 5 ft, the depth to water is measured using an interface probe. The number of DMSs deployed is based on the water volume needed for the required samples. Each sampler is filled with deionized water and attached to a ring on the sampler. In wells where the screened interval is fully submerged, the uppermost DMS is attached to the ring positioned at the top of screen depth. In wells where the screened interval is partially submerged or submerged by less than 5 ft, the uppermost DMS is attached to the highest ring, which will be submerged. Additional required DMSs are individually attached to subsequent lower rings. The tether is secured to the well cap, and the well and well vault are sealed until sampling.

5.1.2.2 Sampling

As the tether is reeled up, each DMS is removed from the well and the contents are decanted into the required laboratory supplied sample bottles. Sample bottles are immediately placed on ice pending shipping. After sample bottles are filled, any remaining water is transferred into the required storage container and held in the appropriate IDW yard pending disposal or analysis, based on the historical analytical results from the GWM well. The dedicated tether is placed in a labeled, protective bag and stored until the next sampling event.

5.2 LOW FLOW SAMPLING

5.2.1 Instruments Used

Low flow sampling is conducted using either a portable or dedicated Bennett pump. When a Bennett pumps fails, the pump is removed from the well and future sampling is conducted using a portable pump, unless approved for DMS use. Interface probes, PIDs, multi-parameter meters with a flow-through cell attached, and turbidimeters are also used during low-flow sampling. Wells without a dedicated pump were designated, based on historical analytical data, as either clean, intermediate, or expected hazardous. Decontaminated, non-dedicated tubing and portable low flow pumps were used to sample wells designated as clean, with the sampling assembly decontaminated following use at each well. Dedicated tubing specific to a given well was used for wells designated as intermediate or expected hazardous.

5.2.2 Methods

Where a portable pump is required, the pump is lowered into the GWM well to a depth of approximately 2 ft below the top of screen for wells where the screened interval is fully submerged. Where the screened interval is partially submerged, the pump intake is placed approximately 2 ft above the bottom of the screen.

Where a dedicated pump is present, an air compressor and tubing for the purge water will be connected to the dedicated equipment. The pump intake is approximately in the middle of the screened interval in wells with dedicated pumps. There are no dedicated pumps in wells with partially submerged screened intervals.

Purging is conducted at a rate of approximately 0.5 liters per minute, with a maximum flow rate of 1 liter per minute and a minimum flow rate of 0.1 liters per minute. Purge water moves through the flow-through cell on the multiparameter meter and then into an appropriate storage container to be held in the appropriate IDW yard pending disposal or analysis. During purging, field parameters including DO, pH, ORP, turbidity, conductivity, specific conductance, and temperature are analyzed using the multiparameter meter and turbidimeter and recorded on field forms at a minimum of 5-minute intervals. Purging is complete when the field parameters have stabilized for three consecutive measurements to within 10% for specific conductivity, DO, and temperature; below 5 nephelometric turbidity units or within 10% for turbidity; and within 0.5 standard units for pH. If stabilization does not occur within an hour of purging, the well is sampled and deviations are noted on field documentation.

After purging is completed, the required sampling containers are filled and placed on ice pending shipping.

5.3 DEVIATIONS

During Q3 2020, one well (KAFB-106009) was sampled using the passive sampling method based on previous technical discussion, but without official written approval. In future sampling events, this well will be sampled using a portable Bennett pump until official written approval is obtained.

6. PRODUCTION WELL DRINKING WATER SAMPLING

6.1 INSTRUMENTS USED

Drinking water sampling is conducted using a multiparameter meter with a sample cup and a turbidimeter.

6.2 METHODS

Prior to sampling at a production well, the pump runs for a minimum of 15 minutes and the sample tap is flushed for a minimum of 1 minute to purge any entrained sediment. Field parameters, including temperature, specific conductance, pH, ORP, DO, and turbidity, are measured using a multiparameter meter with a sample cup and a turbidimeter. Values are recorded on a field form as a snapshot of water quality at the time of sampling. The required sampling containers are filled and sealed, checked for headspace bubbles, and placed on ice pending shipping. Purge water is collected in a 5-gallon bucket, labelled, and held pending disposal.

6.3 DEVIATIONS

In the July sample collected at KAFB-016, the ORP value recorded on the field from was -17.9 millivolts. This reading was most likely an instrument error, as the ORP value at this location is typically comparable to values read at KAFB-015 (257.2 millivolts in July) and was, therefore, not reported.

7. GROUNDWATER TREATMENT SYSTEM

7.1 SAMPLING

7.1.1 Instruments Used

GWTS sampling is conducted using a multiparameter meter with a flow-through cell and a turbidimeter.

7.1.2 Methods

GWTS samples are collected from ports located before the influent skid pumps, between the granular activated carbon vessels, and after the effluent skid pumps. Prior to sampling, the port is flushed for a minimum of 1 minute. Field parameters, including temperature, specific conductance, pH, ORP, DO, and turbidity, are measured using a multiparameter meter with a flow-through cell and a turbidimeter. Values are recorded on a field form as a snapshot of water quality at the time of sampling. The required sampling containers are filled and placed on ice pending shipping.

7.1.3 Deviations

There were no deviations to GWTS sampling in Q3 2020.

7.2 EXTRACTION WELL DISINFECTION

7.2.1 Methods

A pre-disinfection sample is taken before disinfection occurs. Sodium hypochlorite solution is added to 500 gallons of water to provide a concentration of at least 50 parts per million free chlorine when added to an extraction well. The extraction well is shut down, and the diluted sodium hypochlorite solution is gravity-fed down well. The extraction well is kept offline for approximately 24 hours. The well is then turned back online, and its water is pumped down through the conveyance line to the GWTS. This water is discharged to an external sump, bypassing the carbon canisters, where any remaining free chlorine in the well water is allowed to evaporate. A post-disinfection sample is taken after pumping the well free of remaining free chlorine. Pre- and post-disinfection samples are collected from a sample port in the well vault (KAFB-106228 and KAFB-106239) or in the Well Control House (KAFB-106233 and KAFB-106234). Prior to sampling, the pump runs for a minimum of 30 minutes and the sample ports are open for a minimum of 10 seconds to flush any entrained sediment. Samples are analyzed for chlorite, bromate, and perchlorate.

7.2.2 Deviations

There were no deviations to extraction well disinfection in Q3 2020.

7.3 EFFLUENT LINE PRESSURE TEST

7.3.1 Instruments Used

The preinstalled in-line pressure gauge at the GWTS effluent tree is used for the effluent line pressure test.

7.3.2 Methods

The GWTS is shut down and water is directed toward injection well KAFB-7. The isolation valve at KAFB-7 is closed, and valves before and after the effluent skid pumps in the GWTS are closed. The effluent line is pressurized with the 100 pounds per square inch (psi) Kirtland AFB supply water line located on the south wall of the GWTS to 150% of GWTS operating pressure (50 psi). Due to expansion in the line, 30 minutes is allowed before increasing the pressure back up to 50 psi. After 1 hour, a final pressure reading is taken, and if the final pressure is within 30% of 50 psi, the pressure test passes.

7.3.3 Deviations

There were no deviations to effluent line pressure testing in Q3 2020.

8. PURGE AND DECONTAMINATION WATER STORAGE AND DISPOSAL

Prior to GWM sampling for each quarter, historical data from each monitoring well are evaluated to determine how purge or well maintenance water will be initially managed. Typically, purge water is managed in one of three categories: (1) non-hazardous water that meets GWTS discharge criteria, (2) non-hazardous water that requires evaluation/approval prior to discharge to the GWTS, and (3) hazardous or suspected hazardous water that must be managed as a hazardous waste. In addition, ancillary fluids (i.e., decontamination water and calibration fluids) are also managed and, if appropriate, discharged at the GWTS after review/approval of analytical data.

8.1 NON-HAZARDOUS PURGE WATER MANAGEMENT

Non-hazardous IDW purge water collected during sampling of the GWM wells is placed in 55-gallon plastic (poly) drums. The drums are sealed with matching plastic lids with steel, locking-ring collars, labeled with vinyl non-hazardous waste labels, and transferred to the designated non-hazardous IDW yard located on Kirtland AFB. Small volumes of IDW water, typically generated from the sampling of passive sampling devices or sampling of drinking water wells, are placed in labeled, 5-gallon plastic buckets (pails) with sealing lids.

Eligibility for discharge of non-hazardous liquid IDW to the GWTS is determined by comparing historical, well-specific data from the previous two quarters to the acceptance criteria of the GWTS. Liquid IDW from monitoring wells that have historically met the GWTS acceptance criteria is placed on an Auto-Approval List that authorizes discharge to the facility without further review. Any liquid IDW on the Auto-Approval List that is collected, but not yet processed through the GWTS, is temporarily held in the “Pending Disposal” area of the IDW yard.

Liquid IDW sourced from wells with historical data from the previous two quarters that exceeded the GWTS acceptance criteria is held for further evaluation in the “Pending Analysis” area of the IDW yard. Upon receipt of the laboratory analytical data for each well, the data are evaluated against GWTS acceptance criteria. If the data are within GWTS acceptance criteria, the purge water is approved for GWTS discharge. If the data indicate one or more constituents are outside GWTS parameters, the purge water will be processed for offsite disposal at a permitted facility.

8.2 HAZARDOUS PURGE WATER MANAGEMENT

All liquid hazardous waste (purge or well development water) is placed in 55-gallon steel drums with steel tops and locking rings (UN designation 1A2/Y1.2/100/**). When small volumes (less than 5 gallons) of waste are generated at a well, a plastic container with threaded top (jerrican) is used to contain the liquid. The jerrican is then placed in a steel, 55-gallon drum for more secure storage. All waste containers are properly labeled, sealed, and placed on secondary containment pallets located within the appropriate less than 90-day accumulation area. The accumulation areas and waste containers are inspected on a weekly basis by trained personnel as required under 40 Code of Federal Regulations (CFR) 262.34.

Hazardous or suspected hazardous IDW is accumulated in one of two Resource Conservation and Recovery Act (RCRA) less than 90-day accumulation areas associated with the Kirtland Bulk Fuels Facility Project. Hazardous waste generated from routine GWM sampling or well maintenance activities (purge, well development or well rehabilitation water) is placed in the Kirtland AFB Bulk Fuels Facility

RCRA less than 90-day accumulation area. Hazardous or suspected hazardous waste generated during drilling activities is held in the Kirtland AFB Zia Park temporary RCRA less than 90-day accumulation area.

Prior to the start of each quarterly GWM sampling event, a preliminary evaluation is made to identify monitoring wells that are anticipated to generate characteristically hazardous liquid IDW for initial waste segregation purposes. Based on historical analytical data available for each well, the water is suspected to be characteristically hazardous if the concentration of benzene exceeded 500 micrograms per liter (per 40 CFR Part 261.24) in either of the previous two sampling events. Liquid IDW from these wells is managed as a potentially characteristically hazardous waste pending confirmation from laboratory analytical results.

For monitoring wells located in the source area of the groundwater plume that show consistent data that indicate purge water is hazardous, "Generator Knowledge" is used for hazardous waste determination. Use of generator knowledge to determine if solid waste is hazardous is permitted under RCRA regulations 40 CFR 262.11(d)(1).

Upon receipt of analytical data, the IDW remains in the less than 90-day accumulation area if confirmed to be a hazardous waste. If the IDW is determined to not meet hazardous criteria based on analytical data, the non-hazardous waste is transferred to the "Pending Disposal" area of the non-hazardous IDW yard.

All hazardous waste must be removed from Kirtland AFB and properly disposed of off-Base within the required 90-day accumulation time limit. Hazardous waste is transported off Kirtland AFB after it is properly profiled, manifested, and approved for transport by the Kirtland AFB Hazardous Waste Management Group. Waste is transported by a licensed hazardous waste hauler to a permitted treatment, storage, and disposal facility.

9. REFERENCES

Kirtland Air Force Base (AFB). 2016. *Aquifer Test Report for Groundwater Extraction Well KAFB-106228, Bulk Fuels Facility, Solid Waste Management Unit ST-106/SS-111, Kirtland Air Force Base, New Mexico.* Prepared by CB&I Federal Services for Kirtland AFB under USACE–Albuquerque District Contract No. W912DY-10-D-0014. July.

Table B-2
Current and Former Well Designations

Current Well Designation	Previous Well Designation	REI Assignment	Previous Aquifer Assignment
KAFB-003	KAFB-3, KAFB003	—	Regional Deep
KAFB-015	KAFB-15, KAFB015	—	Regional Deep
KAFB-016	KAFB-16, KAFB016	—	Regional Deep
KAFB-106001	KAFB-1061	4857 & 4838	Shallow
KAFB-106002	KAFB-1062	4857	Shallow
KAFB-106003	KAFB-1063	4857	Shallow
KAFB-106004	KAFB-1064	4857	Shallow
KAFB-106005	KAFB-1065	4857	Shallow
KAFB-106006	KAFB-1066	4857	Shallow
KAFB-106007	KAFB-1067	4857	Shallow
KAFB-106008	KAFB-1068	4857	Shallow
KAFB-106009	KAFB-1069	4857	Shallow
KAFB-106010	KAFB-10610	4857	Shallow
KAFB-106011	KAFB-10611	4857	Shallow
KAFB-106012R	KAFB-10612R	4857	Shallow
KAFB-106013	KAFB-10613	4857	Shallow
KAFB-106014	KAFB-10614	4857	Shallow
KAFB-106015	KAFB-10615	4857 & 4838	Shallow
KAFB-106016	KAFB-10616	4857	Shallow
KAFB-106017	KAFB-10617	4857 & 4838	Shallow
KAFB-106018	KAFB-10618	4857 & 4838	Shallow
KAFB-106019	KAFB-10619	4857 & 4838	Shallow
KAFB-106020	KAFB-10620	4857	Shallow
KAFB-106021	KAFB-10621	4857 & 4838	Shallow
KAFB-106022	KAFB-10622	4857 & 4838	Shallow
KAFB-106023	KAFB-10623	4857	Shallow
KAFB-106024	KAFB-10624	4857	Shallow
KAFB-106025	KAFB-10625	4857 & 4838	Shallow
KAFB-106026	KAFB-10626	4857	Shallow
KAFB-106027	KAFB-10627	4857	Shallow
KAFB-106028	KAFB-10628-510	4857	Shallow
KAFB-106029	—	4857	Shallow
KAFB-106030	—	4838	Intermediate
KAFB-106031	—	4814	Deep
KAFB-106032	—	4857	Shallow
KAFB-106033	—	4838	Intermediate
KAFB-106034	—	4814	Deep
KAFB-106035	—	4857	Shallow
KAFB-106036	—	4838	Intermediate
KAFB-106037	—	4814	Deep
KAFB-106038	—	4857	Shallow
KAFB-106039	—	4838	Intermediate
KAFB-106040	—	4814	Deep
KAFB-106041	—	4857	—
KAFB-106042	—	4857	Shallow
KAFB-106043	—	4814	Deep
KAFB-106044	—	4838	Intermediate
KAFB-106045	—	4814	Deep
KAFB-106046	—	4857	Shallow
KAFB-106047	—	4838	Intermediate
KAFB-106048	—	4814	Deep
KAFB-106049	—	4857	Shallow
KAFB-106050	—	4838	Intermediate
KAFB-106051	—	4814	Deep

Table B-2
Current and Former Well Designations

Current Well Designation	Previous Well Designation	REI Assignment	Previous Aquifer Assignment
KAFB-106052	—	4857	Shallow
KAFB-106053	—	4838	Intermediate
KAFB-106054	—	4814	Deep
KAFB-106055	—	4857	Shallow
KAFB-106057	—	4838	Intermediate
KAFB-106058	—	4814	Deep
KAFB-106059	—	4857	Shallow
KAFB-106060	—	4838	Intermediate
KAFB-106061	—	4814	Deep
KAFB-106062	—	4814	Deep
KAFB-106063	—	4838	Intermediate
KAFB-106064	—	4857	Shallow
KAFB-106065	—	4838	Intermediate
KAFB-106066	—	4814	Deep
KAFB-106067	—	4857	Shallow
KAFB-106068	—	4814	Deep
KAFB-106069	—	4838	Intermediate
KAFB-106070	—	4857	Shallow
KAFB-106071	—	4814	Deep
KAFB-106072	—	4838	Intermediate
KAFB-106073	—	4838	Intermediate
KAFB-106074	—	4814	Deep
KAFB-106075	—	4857	Shallow
KAFB-106076	—	4857	Shallow
KAFB-106077	—	4838	Intermediate
KAFB-106078	—	4814	Deep
KAFB-106079	—	4857	Shallow
KAFB-106080	—	4838	Intermediate
KAFB-106081	—	4814	Deep
KAFB-106082	—	4857	Shallow
KAFB-106083	—	4838	Intermediate
KAFB-106084	—	4814	Deep
KAFB-106085	—	4857	Shallow
KAFB-106086	—	4838	Intermediate
KAFB-106087	—	4814	Deep
KAFB-106088	—	4857	Shallow
KAFB-106089	—	4838	Intermediate
KAFB-106090	—	4814	Deep
KAFB-106091	—	4857	Shallow
KAFB-106092	—	4838	Intermediate
KAFB-106093	—	4814	Deep
KAFB-106094	—	4857	Shallow
KAFB-106095	—	4838	Intermediate
KAFB-106096	—	4814	Deep
KAFB-106097	—	4838	Intermediate
KAFB-106098	—	4814	Deep
KAFB-106099	—	4838	Intermediate
KAFB-106100	—	4814	Deep
KAFB-106101	—	4838	Intermediate
KAFB-106102	—	4814	Deep
KAFB-106103	—	4838	Intermediate
KAFB-106104	—	4814	Deep
KAFB-106105	—	4838	Intermediate
KAFB-106106	—	4857	Shallow

Table B-2
Current and Former Well Designations

Current Well Designation	Previous Well Designation	REI Assignment	Previous Aquifer Assignment
KAFB-106107	—	4814	Deep
KAFB-106148-484	—	4857	—
KAFB-106149-484	—	4857	—
KAFB-106150-484	—	4857	—
KAFB-106151-484	—	4857	—
KAFB-106152-484	—	4857	—
KAFB-106153-484	—	4857	—
KAFB-106154-484	—	4857	—
KAFB-106155-484	—	4857	—
KAFB-106156-484	—	4857	—
KAFB-106201	—	4857	Shallow
KAFB-106202	—	4838	Intermediate
KAFB-106203	—	4814	Deep
KAFB-106204	—	4857	Shallow
KAFB-106205	—	4838	Intermediate
KAFB-106206	—	4814	Deep
KAFB-106207	—	4857	Shallow
KAFB-106208	—	4838	Intermediate
KAFB-106209	—	4814	Deep
KAFB-106212	—	4814	Deep
KAFB-106213	—	4857	Shallow
KAFB-106214	—	4838	Intermediate
KAFB-106215	—	4814	Deep
KAFB-106216	—	4857	Shallow
KAFB-106217	—	4838	Intermediate
KAFB-106218	—	4814	Deep
KAFB-106219	—	4857	Shallow
KAFB-106220	—	4838	Intermediate
KAFB-106221	—	4814	Deep
KAFB-106222	—	4857	Shallow
KAFB-106223	—	4838	Intermediate
KAFB-106224	—	4814	Deep
KAFB-106225	—	4857	Shallow
KAFB-106226	—	4838	Intermediate
KAFB-106227	—	4814	Deep
KAFB-106228	—	—	—
KAFB-106229	—	4857	Shallow, Intermediate, and Deep
KAFB-106230	—	4838	Intermediate
KAFB-106231	—	4857	Shallow
KAFB-106232	—	4838	Intermediate
KAFB-106233	—	—	—
KAFB-106234	—	—	—
KAFB-106235-438	KAFB-106235-463	4857	—
KAFB-106235-472	KAFB-106235-492	4838	—
KAFB-106235-501	KAFB-106235-521	4814	—
KAFB-106236-436	KAFB-106236-461	4857	—
KAFB-106236-470	KAFB-106236-490	4838	—
KAFB-106236-499	KAFB-106236-519	4814	—
KAFB-106240-449	—	4857	—
KAFB-106241-428	—	4857	—
KAFB-106242-418	—	4857	—
KAFB-106243-425	—	4857	—
KAFB-106244-445	—	4857	—
KAFB-106245-460	—	4857	—

Table B-2
Current and Former Well Designations

Current Well Designation	Previous Well Designation	REI Assignment	Previous Aquifer Assignment
KAFB-106247-490	—	4857	—
KAFB-106S1-447	—	4857	—
KAFB-106S2-451	—	4857	—
KAFB-106S3-449	—	4857	—
KAFB-106S4-446	—	4857	—
KAFB-106S5-446	—	4857	—
KAFB-106S7-491	—	4857	—
KAFB-106S8-491	—	4857	—
KAFB-106S9-447	—	4857	—
KAFB-3411	KAFB3411	4857	Shallow
ST106-VA2	VA HOSPITAL WELL	—	Regional Deep

— = not applicable
ID = identification
REI = reference elevation interval
VA = Veteran's Affairs

APPENDIX C

Soil Vapor Field Sampling Records
(Not Included in Q3 2020)

APPENDIX D

Soil Vapor Data Quality Evaluation Reports and Data Packages (Not Included in Q3 2020)