



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS 377TH AIR BASE WING (AFMC)

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Colonel Eric H. Froehlich  
377 ABW/CC  
2000 Wyoming Blvd SE  
Kirtland Air Force Base (AFB), New Mexico 87117-5600

Mr. John Kieling, Chief  
Hazardous Waste Bureau (HWB)  
New Mexico Environment Department (NMED)  
2905 Rodeo Park Road  
Santa Fe, New Mexico 87505

Dear Mr. Kieling

Kirtland AFB is pleased to submit, "*Rapid Response Action Additional Data Gap Groundwater Monitoring Wells and Expansion of Groundwater Extraction Work Plan*", for the Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland AFB, NM. This work plan discusses the need for additional data gap wells to define the northern distal plume edge. The plan also outlines activities required to install two additional groundwater extraction wells to expedite the collapse of the down-gradient portion of the dissolved phase ethylene dibromide plume. Further discussed is the process to move and treat the water from the extraction wells to the end point.

Please contact Mr. L. Wayne Bitner at (505) 853-3484 or at [ludie.bitner@us.af.mil](mailto:ludie.bitner@us.af.mil), or Mr. Scott Clark at (505) 846-9017 or at [scott.clark@us.af.mil](mailto:scott.clark@us.af.mil), if you have further questions.

Sincerely

ERIC H. FROEHLICH, Colonel, USAF  
Commander

cc:  
NMED-EHD (Roberts, McQuillan)  
NMED-HWB (Kieling, Cobrain, McDonald)  
NMED (Longmire)  
NMED-PSTB (Reuter)  
NMED-GWQB (Cook, Bustamante, Huddleson)  
NMED-OGC (Kendall)  
EPA Region 6 (King, Ellinger)  
USACE-ABQ District Office (Simpler, McBee, Phaneuf)  
AFCEC-CZR (Bodour)  
Public Info Repository, AR/IR, and File

KAFB4303



**40 CFR 270.11  
DOCUMENT CERTIFICATION  
JUNE 2015**

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.



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ERIC H. FROEHLICH, Colonel, USAF  
Commander, 377th Air Base Wing

This document has been approved for public release.



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KIRTLAND AIR FORCE BASE  
377th Air Base Wing Public Affairs

Prepared by CB&I Federal Services LLC

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June 30, 2015

**Subject: Rapid Response Action, Additional Data Gap Groundwater Monitoring Wells and Expansion of Groundwater Extraction Work Plan, Bulk Fuels Facility, Kirtland Air Force Base, New Mexico**

This Kirtland Air Force Base (AFB) Bulk Fuels Facility Rapid Response Action Groundwater Extraction Work Plan has been prepared by CB&I Federal Services LLC for the U.S. Army Corps of Engineers (USACE), Omaha District, under Contract No. W9128F-12-D-0003, Task Order 0025. This letter Work Plan (hereafter referred to as Work Plan) outlines the activities needed to install additional data gap groundwater monitoring wells to 1) define the northern distal edge of the dissolved-phase ethylene dibromide (EDB) plume and 2) install two groundwater extraction wells to expedite the collapse of the downgradient portion of the dissolved-phase EDB plume associated with Solid Waste Management Units ST-106/SS-111. This Work Plan also describes the installation of a permanent pipeline to convey treated water from the extraction wells to the groundwater treatment system (GWTS), and from the GWTS to the Kirtland AFB Golf Course Main Pond (GCMP) from which it will be used to irrigate the golf course. Additional infiltration galleries will be installed at a later date to receive water when the capacity of the GCMP has been exceeded.

Groundwater modeling scenarios were performed by CB&I in cooperation with the U.S. Environmental Protection Agency (EPA) Region 6, using the EPA Visual Modflow Model. These scenarios evaluated the most effective extraction well locations for plume capture and collapse. Two proposed well locations were agreed upon by USACE, Air Force Civil Engineer Center, the New Mexico Environment Department (NMED), CB&I, and other New Mexico stakeholders at a June 24, 2015 Modeler Working Group meeting. Data obtained from the additional data gap groundwater monitoring wells (data gap wells) and the two extraction wells will be used to inform any additional data gap wells and the expansion of the GWTS in calendar year 2016. This Work Plan outlines the activities required to install the data gap wells along with the extraction wells, and treat the extracted groundwater.

Components of the project include the following:

- Installation of three data gap wells, one observation groundwater monitoring well (observation well), and two groundwater extraction wells (see Table 1 and Figure 1). The data gap well locations were chosen to define the northern end of the dissolved-phase EDB plume, and the observation wells will inform the design and monitor the performance of the extraction wells. The extraction wells will expand the existing pump-and-treat system to expedite the collapse of the downgradient portion of the dissolved-phase EDB plume.
- Installation of permanent conveyance piping from the extraction well locations to the GWTS on Kirtland AFB property. This will include the installation of a flush vault at each extraction well location and a control panel for the well pump either at, or near, each extraction well location. Conveyance piping will be belowground and installed by directional drilling or trenching, depending on site conditions.

- Installation of permanent conveyance piping from the GWTS to an existing 15-inch pipeline, which conveys water from production well KAFB-7 to the GCMP (Figure 2). This piping will be installed in a trench, using directional-drilled road crossings installed under a different contract.
- Installation of piping and infiltration galleries near the Kirtland AFB golf course to divert water from the treatment plant to the trenches during periods when the GCMP does not have the capacity for the total inflow.

### **Installation of Data Gap and Observation Groundwater Monitoring Wells**

Data from 16 new monitoring wells installed from December 2014 to June 2015 were used to drive the decision to install additional data gap wells to fully define the dissolved-phase EDB plume. Results of sampling from these wells indicated that the northern end of the dissolved-phase EDB plume is not fully defined in the Shallow and Intermediate Zones. EDB was detected above the EPA maximum contaminant level of 0.05 micrograms per liter in newly installed Shallow Zone well KAFB-106225 and Intermediate Zone well KAFB-106227 at the northern end of the plume. The Deep Zone well in this cluster was non-detect for EDB, thus indicating that the Deep Zone of the plume is largely defined. The stakeholders identified the need for additional data gap wells in this area to fully define the distal end of the EDB plume.

Three locations and screen intervals were identified for data gap wells to determine the boundaries of the northern end of the EDB plume in the Shallow and Intermediate Zones (Figure 1). Two wells will be located on Kathryn Avenue (Ave) between Georgia Street (St) and Indiana St. The first, KAFB-106231, will be screened from 20 feet above the water table to 15 feet below. The second, KAFB-106232, will be screened from 45 to 60 feet below the water table. The third data gap well (KAFB-106230) will be located on Anderson Ave between Florida and Georgia St which will be screened from 45 to 60 feet below the water table.

One observation well, KAFB-106229, will be installed near extraction well KAFB-106233, which is located near Gibson Boulevard (Blvd) and California St (Figure 1). This well will be cored from 20 feet above the water table to the bottom of the borehole during drilling to provide lithologic information to inform extraction well design and construction. In addition, the observation well will provide data on extraction well performance and will result in a more robust understanding of the data collected during aquifer testing.

Data gap well KAFB-106230, which will be located near extraction well KAFB-106234, will also be continuously cored during drilling. This well will act as both a data gap well and an observation well to provide information about the EDB plume boundaries, and to inform the design of KAFB-106234.

Two of the data gap wells will be drilled using only air rotary casing hammer (ARCH) drilling. The observation well, and the combined data gap and observation well will be drilled using a combination of ARCH and sonic drilling methods. The ARCH drilling method will be used to advance the borehole to 20 feet above the water table. Sonic drilling will then be used to collect continuous core from 20 feet above the water table to the bottom of the borehole. The continuous core samples will be logged for lithology, and select samples will be submitted for particle-size analysis, permeability, hydraulic conductivity, and effective porosity. Core samples will be archived and stored in a secure location on Kirtland AFB property for examination by the NMED and other stakeholders. The ARCH rig will then return to the boring, overdrill down to total depth, and will complete the observation well.

All wells will be installed in accordance with the approved Groundwater Investigation Work Plan (USACE, 2011) and subsequent correspondence between the NMED and Kirtland AFB pertaining to groundwater well installation. Dedicated Bennett sampling pumps will be installed at each data gap well.

Development and sampling of these groundwater monitoring wells will follow the procedures outlined in the NMED-approved Groundwater Investigation Work Plan (USACE, 2011).

### **Installation of Extraction Wells KAFB-106233 and KAFB-106234**

Proposed extraction well KAFB-106233 will be located at an alley off of California St, just north of Gibson Blvd. Extraction well KAFB-106234 will be located at the intersection of Georgia St and Anderson Ave (Figure 1). These extraction wells will be screened to extract water from the Shallow, Intermediate, and Deep Zones of the aquifer. The wells will be installed using mud rotary drilling technology.

The continuous core collected from the observation well, and the data gap well KAFB-106230, will be used to inform the final design of the extraction wells. The extraction wells will be designed to capture the maximum radius of influence, and to obtain at least 70 percent well efficiency.

During mud rotary drilling, continuous core will be collected from 20 feet above the water table to the bottom of the borehole. The continuous core samples will be logged for lithology, and select samples will be submitted for rapid-turnaround particle-size analysis. The results of these samples will confirm the well construction specifications that were determined by the groundwater monitoring wells. Core samples will be archived and stored in a secure location on Kirtland AFB property for examination by the NMED and other stakeholders.

Due to the depth of the wells, the extraction pump at each well will be a multi-stage centrifugal pump designed to produce up to 200 gallons per minute (gpm). Final design specifications of the extraction wells will be determined based on the results of the groundwater flow model, and lithology data from the pilot soil borings. The extraction well pumps will be powered from a Public Service Company of New Mexico service drop and aboveground control panels that will be installed as close as possible to each of the extraction wells. This will require that Public Service Company of New Mexico extend their existing three-phase power lines to the well locations. The exact location of these control panels will depend on the ability to secure rights-of-entry for their installation. The well pumps will be controlled from the GWTS, either by control cables buried with the well piping or by a telemetry system. A buried vault similar to that at KAFB-106228 will be installed at each wellhead to house piping, instrumentation, electrical components, and a port for sampling. The vault will be locked and will have intrusion alarms to shut down power to the pump if the vault is opened.

### **Well Development and Aquifer Testing at Extraction Wells**

Well development at extraction wells KAFB-106233 and KAFB-106234 will follow steps 1 through 4 outlined in the approved *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #3* (USACE, 2015a), with the addition of changes outlined in the *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #4* (USACE, 2015b).

Thirty days after approval of final extraction well design, a work plan will be submitted detailing aquifer testing at extraction wells KAFB-106233 and KAFB-106234. The work plan will incorporate the methods described in the *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan* (USACE, 2015c). In addition, any lessons learned during well development and testing at KAFB-106228 will be incorporated into well development and aquifer testing. Water generated during development and testing will be transported through the newly installed influent pipelines to the GWTS for treatment and discharge.

## Extracted Groundwater Conveyance Pipeline to GWTS

Groundwater from the two extraction wells (Figure 1) will be pumped through double-walled, high-density polyethylene (HDPE) pipelines to the GWTS located just east of Louisiana Boulevard on Kirtland AFB property. The GWTS will be installed as part of a separate contract, and will be operational when the extraction wells begin pumping. Barring any conflicts with existing utilities, it is anticipated that the main influent pipeline capable of conveying 600 gpm will be installed on Eastern Ave and cross Louisiana Blvd to reach Kirtland AFB property (Figure 1). Piping capable of conveying up to 200 gpm will convey water from each wellhead through city alleyways to the main influent pipeline. Groundwater will be treated to remove EDB and any other organics to below maximum contaminant levels prior to discharge to the GCMP or infiltration galleries.

The conveyance pipe will be a buried double-walled HDPE pipe with varying size inner and outer diameters to meet engineering flow requirements. Leak-detection monitoring will be installed on the double-walled pipe system. The pipeline will be leak-tested before it is put into service. The control cables for the extraction pumps as well as the intrusion alarm cable will be run in the same trench as the groundwater pipeline.

## Treated Groundwater Conveyance Pipeline to GCMP and Infiltration Galleries

A permanent buried pipeline will be installed to replace the existing aboveground temporary pipeline. This pipeline will convey the treated water from the GWTS to an existing 15-inch pipeline that transports water from KAFB-7 to the GCMP (Figure 2). The conveyance pipe will be a buried single-walled HDPE pipe capable of carrying up to 800 gpm. The pipeline will be leak-tested before it is put into service.

In addition, infiltration galleries will be installed to receive water that exceeds that capacity of the GCMP. The location and size of the infiltration galleries will be determined by percolation testing at multiple locations near the golf course. Once the percolation testing has identified appropriate locations for the infiltration galleries, piping will be added to the existing 15-inch pipeline, which will be valved to deliver water to the GCMP or the infiltration galleries as needed.

## Permitting

**Application to Drill and Install Monitoring and Extraction Wells:** Permits will be obtained from the Office of the State Engineer (OSE) to drill and install the monitoring and extraction wells with no consumptive use of water (WR-07). These permit applications generally take 2 to 3 weeks for approval.

**Change of Water Rights Application:** A permit application to change an existing water right (WR-06) is required from the OSE to begin pumping and treatment at the three extraction wells. This permit is submitted directly to the OSE for review. Following an initial 14-day filing period, the OSE will issue a legal notice that is run in the *Albuquerque Journal* 1 day a week for 3 consecutive weeks. A 10-day protest period begins after the last day of public notice has been completed. If no protest is filed during the protest period, there will be an estimated additional 6 weeks of review, after which the OSE will issue a technical memorandum and the permit. If a protest is filed during the 10-day protest period, the hearing process will begin, which could take additional months to resolve before the permit is issued. Kirtland AFB is currently drafting this permit application and is in communication with the OSE to ensure all details are captured. Additional permits will be required depending on the final disposition of the extracted and treated water.

**Easements/Rights of Entry:** Installation of the wellhead control panels will require either easements on commercial/private property, or permission from the City of Albuquerque to install the panels in an electrical service box on existing City easements.

**Excavation and Barricade Permits:** Excavation and barricade permits are required from the City of Albuquerque to perform work and break ground on city streets. These permits take approximately 2 weeks to receive.

**Discharge Permit:** The NMED Groundwater Quality Bureau has issued a temporary permission to discharge water to the GCMP on Kirtland AFB property. This permission expires 120 days from the date of initial discharge. Once the infiltration galleries are completed, treated water will be discharged at the galleries under the current, existing discharge permit DP-1770, which allows for discharge of up to 200 gpm to infiltration galleries on Kirtland AFB property. Concurrently, a request for modification of DP-1770 will be submitted to revise the discharge amount to up to 1,200 gpm, and will include the GCMP as a discharge location.

### **Bird Air Strike Hazard**

Standing water accumulated in the infiltration galleries could attract birds to the area, thus creating a bird air strike hazard for aircraft. To prevent the attraction of bird populations, fail-safes such as a high-level switch to stop pumping if the water level reaches a critical height will be included in the infiltration gallery design. Attachment 1 includes a memo with recommended mitigation strategies if it is determined that a bird air strike hazard exists, although it is anticipated that with the design components, no additional birds will be attracted to the area.

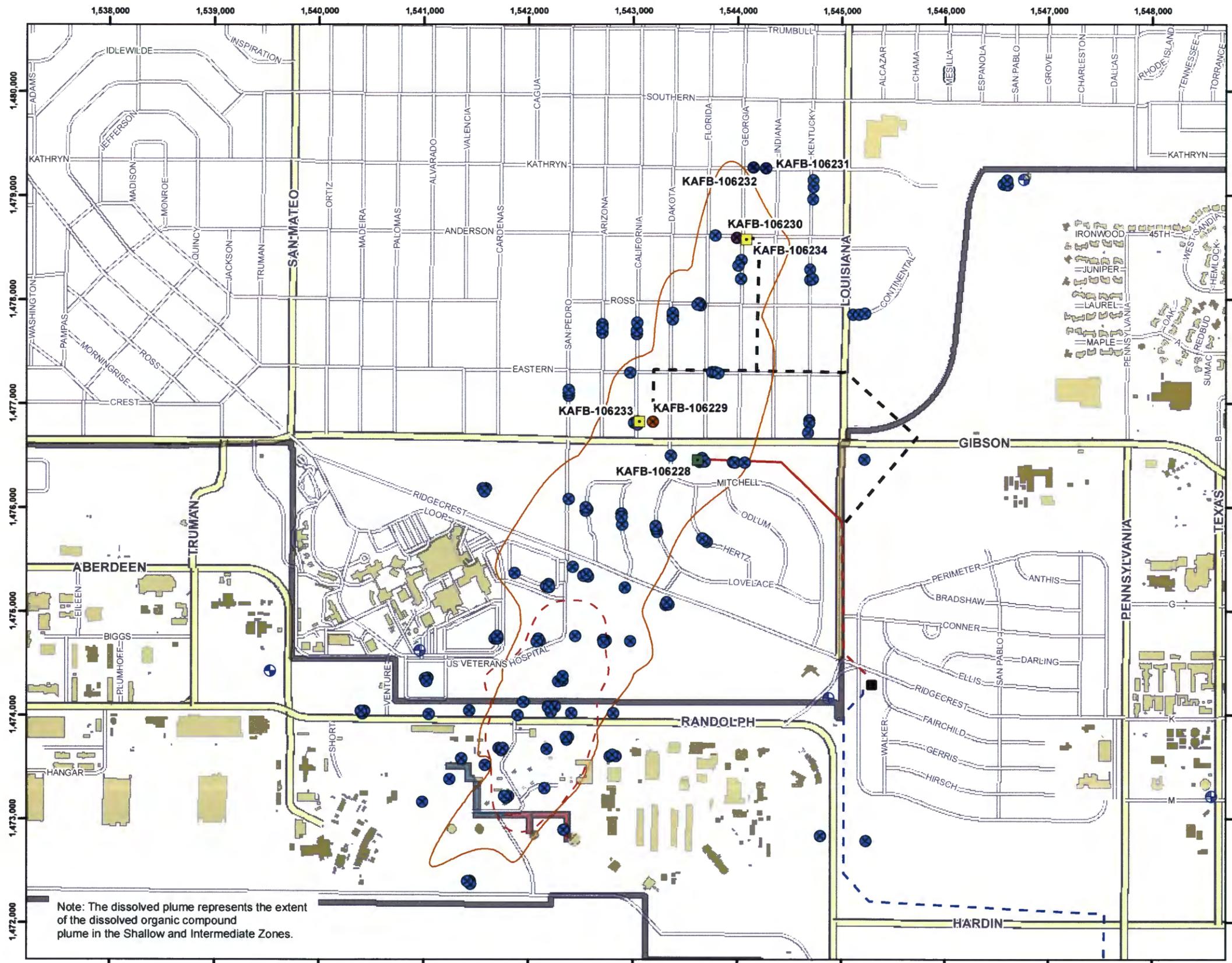
### **Investigation-Derived Waste**

The transportation and disposal of investigation-derived waste soil and water will be conducted in accordance with federal, state, and local regulations. Based on previous work conducted at the site, it is anticipated that the soil cuttings generated during the extraction well installation will meet the requirements for disposal at the Kirtland AFB landfill. Roll-off containers of drill cuttings will be transported from the off-base location where they are filled to an on-base location, pending determining disposition. The existing procedures and requirements for submitting soil profiling to Kirtland AFB will be followed, and needed approvals for disposal at the Kirtland AFB landfill will be obtained. Additionally, based on previous work, it is anticipated that the development water from the extractions wells will be treated through a temporary treatment system and/or GWTS. All treated water will meet the NMED Groundwater Quality Bureau discharge permit requirements.

**References**

- USACE. 2015a. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #3 Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by CB&I Federal Services, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. March.
- USACE. 2015b. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #4 Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by CB&I Federal Services, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. May.
- USACE. 2015c. *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan, Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by CB&I Federal Services, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. March.
- USACE. 2011. *Groundwater Investigation Work Plan, Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by Shaw Environmental & Infrastructure, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. March.

## FIGURES



Note: The dissolved plume represents the extent of the dissolved organic compound plume in the Shallow and Intermediate Zones.

**Legend**

- Proposed Extraction Well
- Existing Extraction Well
- Proposed Observation Monitoring Well
- Proposed Data Gap and Observation Monitoring Well
- Proposed Data Gap Monitoring Well
- Existing Monitor Well
- Water Supply Well
- - - Proposed Influent Piping
- Influent Piping
- - - Permanent Underground Discharge Piping
- - - Permanent Underground Influent Piping
- Dissolved Plume January 2015
- New Groundwater Treatment System Building
- Historical Area of Observed LNAPL (July 2009)

**SITE LOCATION**

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, ALEX, Geomapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Revision Date: 06/26/15

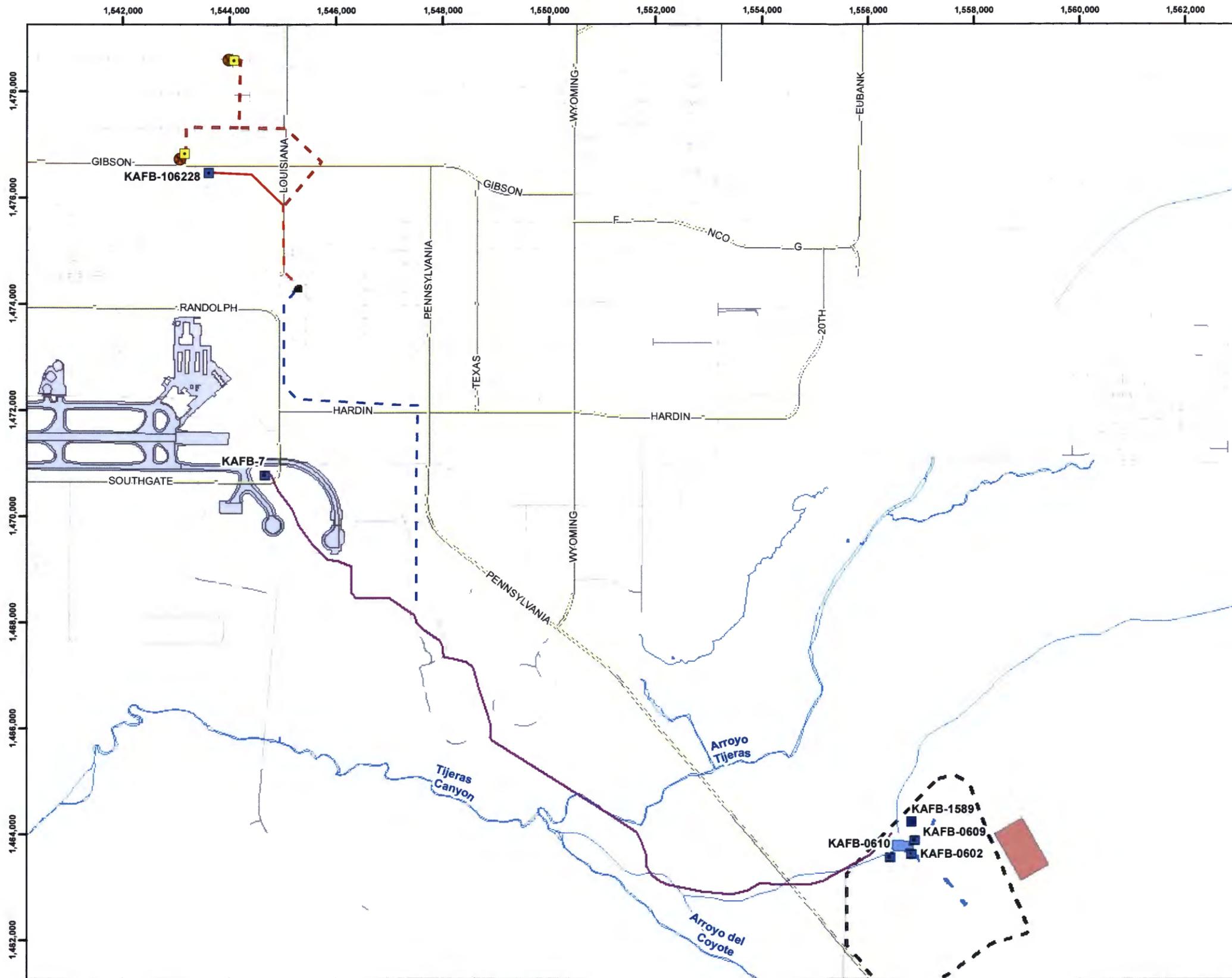
0 500 1,000 2,000  
Feet  
1 inch = 1,000 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

**RAPID RESPONSE GROUNDWATER  
EXTRACTION WORK PLAN  
BULK FUELS FACILITY  
KIRTLAND AIR FORCE BASE, NEW MEXICO**

**FIGURE 1**

**EXTRACTION WELL LOCATIONS**



- Legend**
- Proposed Extraction Well
  - Proposed Monitoring Well
  - Existing Extraction Well
  - - - Proposed Influent Piping
  - Influent Piping
  - - - Permanent Underground Influent Piping
  - - - Permanent Underground Discharge Piping
  - Pipe from KAFB-7
  - ~ Surface Water
  - Permanent Groundwater Treatment System
  - Proposed Golf Course East Infiltration Trench Area
  - Tijeras Arroyo Golf Course
  - Water Body



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Revision Date: 06/25/15

0 1,000 2,000 4,000  
Feet  
1 inch = 2,000 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

RAPID RESPONSE GROUNDWATER  
EXTRACTION WORK PLAN  
BULK FUELS FACILITY  
KIRTLAND AIR FORCE BASE, NEW MEXICO

**FIGURE 2**

GROUNDWATER TREATMENT  
SYSTEM DISCHARGE TO  
TIJERAS ARROYO GOLF COURSE

## TABLES

**Table 1. Proposed Data Gap Groundwater Monitoring, Observation, and Extraction Well Descriptions**

<b>Well ID</b>	<b>Well Type</b>	<b>Description</b>	<b>Well Screen Interval</b>
KAFB-106229	Observation Groundwater Monitoring Well for KAFB-106233	Located near intersection of California Street and Gibson Boulevard	100 feet with 20 feet above and 80 feet below water table
KAFB-106230	Data Gap Groundwater Monitoring Well and Observation Groundwater Monitoring Well for KAFB-106234	Located near KAFB-10626 on Anderson Avenue between Florida Street and Georgia Street	15 feet with 45 to 60 feet below water table
KAFB-106231	Data Gap Groundwater Monitoring Well	Located on Kathryn Avenue between Georgia Street and Indiana Street	35 feet with 20 feet above and 15 feet below water table
KAFB-106232	Data Gap Groundwater Monitoring Well	Located on Kathryn Avenue between Georgia Street and Indiana Street	15 feet with 45 to 60 feet below water table
KAFB-106233	Groundwater Extraction Well	Located at alley off of California Street north of Gibson Boulevard	To be determined—Will be based on data from observation groundwater monitoring wells
KAFB-106234	Groundwater Extraction Well	Located at intersection of Georgia Street and Anderson Avenue	To be determined—Will be based on data from observation groundwater monitoring wells

## ATTACHMENTS



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS AIR FORCE SAFETY CENTER

22 June 2015

MEMORANDUM FOR AFCEC/CZO  
ATTN: MR. L. WAYNE BITNER

FROM: HQ AFSEC/SEFW  
9700 Ave. G SE, Suite 266D  
Kirtland AFB, NM 87117-5671

SUBJECT: Kirtland AFB Bulk Fuels Remediation Project Infiltration Galleries

1. The Air Force Bird/wildlife Aircraft Strike Hazard (BASH) Team met with representatives from the Air Force Civil Engineer Center, United States Army Corps of Engineers, Chicago Bridge & Iron Company, and the Tijeras Golf Club to discuss possible flight safety issues regarding the establishment of infiltration galleries just east of the golf course perimeter in support of the Bulk Fuels Remediation Project.
2. Introducing surface water into an arid environment does have the potential to attract several species of birds, to include species hazardous to flight safety, such as waterfowl and cranes. The level of bird attraction will be determined on the size of the gallery, water depth and length of time water remains on the surface. Although the closest runway is 3.2 miles away from the gallery, it is still within the aerodrome's zone of safety in regards to wildlife hazards.
3. The increased risk to aircraft will be minimal if the infiltration galleries function as designed. To mitigate any increased risk to flight safety, the BASH Team recommends: 1. Conduct on-going, year-round bird surveys and document species, numbers, and behavior; 2. Redesign galleries if water remains on the surface longer than projected and leads to an increase in bird attraction; 3. Harass birds off galleries using pyrotechnics and reinforce with limited depredation, if necessary; 4. Remain open and flexible to expeditiously modify or discontinue galleries if bird attraction and use becomes unmanageable.
4. Involve a Wildlife Damage Control Biologist in the planning, execution and monitoring of the remediation project until completion.

A handwritten signature in black ink, appearing to read "Daniel P. Sullivan".

Daniel P. Sullivan  
Chief, USAF BASH Program

Cc:  
HQ AFSEC/SEF  
USACE ALBUQUERQUE  
CB & I CO.  
AFMC 377 MSG/CENMP