August 13, 2016 Community Conversation for Kirtland Air Force Base (KAFB) Bulk Fuels Facility (BFF) Jet Fuel Leak

New Mexico Environment Department and Air Force Responses to Questions

Questions & topics from the breakout groups presented to the New Mexico Environment Department (NMED) and Air Force for the second hour of the session (typed here verbatim from what was written on the board at the front of the room).

*** Marks last question from the group that we were able to answer at the event within the given timeframe*

We have answered the questions based on our best interpretation of the questions. Given the technical and complex nature of many of the questions, we have pointed to project documents that provide detailed information for the response. We are available to meet to further discuss our responses and the documents.
Questions / Concerns (Q) and Responses (R) are detailed below:

Group 1 (G1; group lead – Nancy Bearce)
G1-Q1) Decide/brainstorm on future of remediated water going to KAFB golf course.

G1-R1)
The Air Force and New Mexico Environment Department (NMED) have had multiple technical and logistical discussions about what to do with the treated water that have included the City of Albuquerque and Albuquerque Bernalillo County Water Utility Authority (Water Utility Authority).

As soon as the pump and treat interim measure was identified, the project team examined numerous options for the treated water given infrastructure needs, permitting requirements, ability to handle the quantities of treated water, the best use of taxpayer money, worker and infrastructure safety, timing, and overall sustainability. Given these parameters, the Base golf course was identified as the most appropriate option as it had the infrastructure in place for moving the water, quick timing/immediate availability, provided the best cost to taxpayers, and was considered sustainable by using treated water instead of drinking water for irrigation purposes.

In addition, the project team understood the golf course could not use the treated water during winter months due to damaging infrastructure (i.e., pipes freezing) and no irrigation activities occurring. Given the lack of winter irrigation at the golf course, the project team identified the need for additional options for the treated water. Based on a review of existing Base infrastructure and the well construction details of an existing production well previously used to irrigate the Base golf course, the project team determined that gravity-fed injection at that existing production well was the best option for winter months. A pilot test demonstration began on February 22, 2016; the goal of the pilot test is to determine if adding treated water to the regional aquifer would work. Data collected to date indicates that adding treated water via a gravity-fed approach into the regional aquifer can be done without adverse impact to the aquifer and provides another productive, probably more sustainable approach. As more extraction wells come online, the project team will continue to revisit this use of treated water, as appropriate.

G1-Q2) Where are the independent studies?

G1-R2) Reports and project documents (including studies, work plans, final reports, etc.) are posted on the NMED website (as they are submitted) located: https://www.env.nm.gov/HWB/kafbperm.htm#KAFBBulkFuelsFacSpill and/or Kirtland website (www.kirtlandjetfuelremediation.com).

G1-Q3) Are materials in the aquifer treated or only water? **

G1-R3)
Materials in both the dry vadose zone (i.e., soil and air) and the aquifer (i.e., soil and water) where the leak happened are being treated based on the various phases of the fuel and its interactions with soil, air, and water material. Fuel released into the environment is found in four phases:
1) LNAPL residual fuel (free product (i.e., oil));
2) Soil vapor (lighter fuel constituents as vapor in soil air);
3) Adsorbed contaminants (fuel constituents attached to soil particles); and
4) Dissolved contaminants (fuel constituents in groundwater).

Depending on the phase being targeted, treatment may focus on one phase or multiple phases. As for the materials in the aquifer (i.e., adsorbed and dissolved contaminants), the dissolved EDB-contaminated groundwater along with adsorbed EDB to soil is being pulled into the pump and treat system which is an interim measure for the BFF site. The LNAPL residual fuel has been removed at the BFF site through multiple processes: 1) Skimmer technology that vacuum the floating fuel; 2) Bioslurping technology that vacuums and destroys the fuel constituents by combustion engine, e.g., soil vapor extraction system, and/or catalytic oxidizer; and 3) Bioremediation by native bacteria to breakdown the fuel constituents.

The second pilot test will evaluate air-lift bioremediation technology to treat the aquifer soil material smeared with LNAPL (i.e., adsorbed contaminants) and the vadose just above the aquifer in the source area. For more details please see the 2016 Strategic Plan (https://www.env.nm.gov/NMED/Issues/KirtlandFuelPlume/documents/KAFB2016StrategicPlan_Version2.0_Final.pdf) – Introduction pp 5-6, Strategies pp 11-19.

G1-Q4) How does extraction work? Does it result in contaminated water? What happens to water?
G1-R4)
Extraction wells are installed into the groundwater at specific locations and to a depth based on the known dissolved phase of the ethylene dibromide (EDB) plume footprint, concentration trends, and soil/geology that makes up the aquifer environment. Additionally, groundwater modeling was used to identify the best locations to capture the EDB-contaminated water. Pumps installed within the extraction wells move EDB-contaminated water through leak protected, double-walled conveyance pipes to the Groundwater Treatment Facility located on-Base. At this facility, the water goes through filters to remove particles that could clog the facility treatment process. Then the EDB-contaminated water is pumped through two tanks with 20,000 pounds of Granulated Activated Carbon (GAC) each to remove contaminants. All extracted water passes through this filter media so no contamination remains in the water. The treated water is tested to ensure it meets regulatory standards and is then discharged to either the Base golf course or injected back into the regional aquifer through a gravity-fed injection well on-Base (see G1 Q1-R1 for more information about this well). For more details, please see 2016 Strategic Plan at:

https://www.env.nm.gov/NMED/Issues/KirtlandFuelPlume/documents/KAFB2016StrategicPlan_Version2.0_Final.pdf page 17, the Remediation Strategies NMED webpage at https://www.env.nm.gov/kafbfuelplume/kafb-fuel-plume-remediation-strategies/ and posters 1-4 from the April 2016 public meeting (Attachment A).

G1-Q5) Schedule for future remediation wells?
G1-R5)
A fourth extraction well site has been chosen and is expected to be installed in winter 2016. This well was located and designed based on the operational data from the three extraction wells, the aquifer pump test done at the first extraction well, and the revised modeling data based on the first extraction well aquifer test results. All this information was used to pick the best, or optimal, location for the fourth extraction well and determine its pumping rate to capture the EDB contamination. Once we get the fourth extraction well installed, the technical team will evaluate the performance of all extraction wells before determining when and where additional extraction wells should be installed. Should it be determined that an additional extraction well(s) is needed, there is a contract already in place to perform this work. (See Attachment B – map of extraction wells)

G1-Q6) How much water are we using – not reusing to 'clean' water?
G1-R6)
All extracted groundwater is treated and all water coming out of the treatment system is clean of contaminants of concern before it is discharged for land application such as irrigating the Base golf course or gravity-fed into the regional aquifer. Treated water applied to the Base golf course is used to water golf course greens that would otherwise be watered with drinking water from the KAFB drinking water supply system. When treated water is gravity-fed into the aquifer, the full volume of extracted and treated water is recharged to the aquifer and available for use. As of August 19, 2016, the pump and treat system has extracted 102,671,100 gallons of EDB-contaminated water from the aquifer. All reported numbers for operations and maintenance including gallons of extracted water, where and how much the treated water was discharged, flow rate, EDB removed, and sampling of the treatment facility for both the temporary treatment system which operated from June 2015 to December 2015 and the full scale treatment system operating from December 31, 2015 to present are in Quarterly Reports and are posted on the NMED website (as they are submitted) located: https://www.env.nm.gov/HWB/kafbperm.htm#KAFBBulkFuelsFacSpill and/or Kirtland website: www.kirtlandjetfuelremediation.com.

G1-Q7) Sources reporting independent of <u>cause</u> (KAFB)?

G1-R7)
Perhaps this question could be clarified by someone in the group who presented it. We are unsure what the question is asking.

<u>Group 2 (group lead – Lou)</u>
G2-Q1) Please address safety / cleanness of water to drink & live above.

G2-R1)
Residents in the City of Albuquerque, including residents living directly above the fuel plume, receive their water from the Water Utility Authority. The following link outlines the process the Water Utility Authority follows regarding drinking water, http://www.abcwua.org/SWTP_Source_and_Finished_Water_Monitoring.aspx. The Water Utility Authority is required by law to meet drinking water standards under the Safe Drinking Water Act

(SWDA), and as part of these requirements, they sample their water distribution system and supply wells once every 3 years. There are six drinking water supply wells around the plume – three KAFB, one VA, and two Water Utility Authority. These drinking supply wells are tested monthly and have had no detections of contaminants. An annual report on water quality is prepared and sent to all Water Utility Authority customers and provided in a special insert to the Albuquerque Journal. Further, there is a Water Utility Authority resolution in place that outlines what is to happen if EDB is detected in a water production well in the vicinity of the BFF contamination plume – the well would be shut off and alternate water sources used. Drinking water provided by the Water Utility Authority continues to be free of any detectable fuel contamination and is safe for all uses.

Drinking water provided by the Veteran's Administration hospital and at KAFB is subject to the SWDA. These wells are also sampled monthly and continue to not have any detections of fuel constituents.

Fuel from the Air Force did not leak at the ground surface in residential areas or parks neighboring the base so there is no concern regarding vapor exposure at the surface in the residential areas. The portion of the fuel contamination that exists off KAFB is in the dissolved phase, meaning it exists in the groundwater. The ability for fuel constituents to cause a vapor concern near the surface depends on a number of factors: the concentration of the fuel compound, the depth to the plume, and the types of soil (e.g. cobblestones, sand, silt and/or clays). It is the combination of these factors that we assess to determine if the EDB plume affects the residential areas above the plume. Based on what we know to date, there is no threat of vapor reaching the ground surface from the dissolved fuel in the aquifer because:

- EDB-measured concentrations within residential areas of groundwater are consistently low. These low concentrations limit the amount of EDB vapor that can form in soil air spaces above the groundwater.
- The EDB plume in residential areas is 455 to 480 feet below the ground surface.
- Residential soil types are made up of cobblestones, sand, silt, and/or clays which work together to prevent any EDB vapors from reaching the ground surface.

For more details see the KAFB Fuel Leak Exposure and Risk Dashboard and the Garden Information Sheets (Attachments C and D).

G2-Q2) Need 3rd party oversight

G2-R2)
The Air Force cannot pay for a third-party selected by the community because of the procurement process (Federal Acquisitions Regulation [FAR]; www.acquisition.gov). Furthermore, once work has been contracted and money allocated, neither the NMED nor Air Force can procure another contract to complete the same scope of work without demonstrating a *bona fide* need for duplicative work. This process ensures fair and appropriate use of tax-payer dollars.

The Air Force can use other federal agencies, such as the United States Army Corps of Engineers (USACE), to issue procurement actions (e.g., contracts) to hire pre-screened companies who are selected through a scrutinized and rigorous process to perform environmental work. All federal agencies have to follow federal procurement regulations, which is a system of checks and balances to ensure work is performed in an independent and technically sound way. The selection and procurement of services must follow a strict, legal procedure (i.e., FAR). Given this procurement process, which has independent review processes for each agency, it would not be a proper use of taxpayer dollars and does not comply with the FAR to have the Air Force pay for an additional layer

of "independent" oversight to perform work. This is because a federal agency cannot issue a duplicate contract for work that is already being done in an independent fashion through current contracts. There are very similar procurement requirements in place for New Mexico state agencies including NMED. See General Services Department purchasing webpage at http://www.generalservices.state.nm.us/statepurchasing/

If the community/neighborhood associations are willing to obtain funding through another source, they can select and hire a third party sampler and/or laboratory to take and analyze environmental samples for this site. However, this third party must meet federal requirements to access, collect, and process samples to ensure integrity and reliability of the sample results. At a minimum, the following criteria and processes would need to be met to perform work at the BFF site:

- Government oversight to obtain access to wellheads,
- Personnel certified to collect environmental samples,
- Laboratories certified by the government to ensure that the data is accurate and that standard protocols are used for sample analyses (i.e., quality assurance/quality control procedures and standard methods),
- Samples have a clear chain of custody,
- The laboratory certifies analytical results, and
- A final report is prepared for the government and community.

In order for samples collected outside of the project structure to be meaningful, the processes and results need to meet the same requirements that the project is required to follow under federal law. To ensure sample integrity and be comparable to project-generated results, the sampler who is certified to collect a hazardous waste sample (HAZWOPER-certified) will collect the samples with the government present and have NMED approval for the work conducted. This person would then be responsible for ensuring these samples follow and meet the same processes as described above.

G2-Q3) Need access to Tech. mtgs – people need to know all **

G2-R3)
The project team recognizes the importance of keeping the public well informed and engaged in the process. That said, the technical working group meetings are not an appropriate or effective venue for public participation. NMED and Air Force will be holding the first Public Technical Workshop this November 12, 2016 at the Christ United Methodist Church from 9 am to 1 pm. These meetings, which will involve a technical discussion of data being evaluated for the project, will continue as long as community members are interested and indicate that they are useful for providing a format for open dialog between the project team and the public. The project team has heard the continued request from the public to have an opportunity to participate in technical discussions and we believe the Workshop will help answer that call.

The technical working groups are a forum by which technical staff representing NMED and the Air Force exchange information and ideas through phone calls, emails, and in-person meetings. The purpose is to increase the quality of required documents (such as work plans, reports, and draft permits) being submitted by the Air Force to NMED. These are not meetings of a decision making body and no final agency actions are being taken, thus, the meetings are not subject to the New Mexico Open Meetings Act, or the public participation requirements of Resource Conservation and Recovery Act (RCRA) or the New Mexico Hazardous Waste Act. The discussions at technical working group meetings frequently involve preliminary and confidential information that is necessary for making informed decisions. Working group participants come to the table with decades of experience on cleanup across the nation. Their ability to openly share information without concern of

information being taken out of context or made public maintains the integrity of the goals of the technical working groups.

Documents formally submitted to NMED are made available to the public on the NMED website and through the Inspection of Public Records Act (IPRA) process if requested. No permit decisions are being made without applicable public notice and participation, as required by law. The technical work plans submitted and approved by NMED are for interim measures taken as part of the RCRA corrective action process and are not final remedies. As part of the RCRA Corrective Measures Evaluation, all interim measure processes will be available for public review and comment before the final remedies are selected.

G2-Q4) Is plume contained & to what degree has this been tested/monitored

G2-R4)
At the July public meeting, the project team presented the first line of evidence that the extraction well locations are drawing down the northern end area of the ethylene dibromide (EDB) plume. This is based on the depression in water-levels across the EDB plume area using the most current field water-level measurements (collected at the end of March 2016) from the Bulk Fuels Facility groundwater monitoring network. The initial line of evidence, which shows the "cone of depression", demonstrates that the three current extraction wells are in the right locations. The next line of evidence will be further depression of water-levels and reduction of EDB mass. The third line of evidence will be the reduction of the EDB plume footprint. At this early stage, a significant reduction in EDB concentration has not been observed yet, but is expected in the future. It is important to note that it will take a few years before there will be substantive changes in the EDB mass numbers and footprint.
Currently, 134 groundwater monitoring wells are sampled in the affected area on a semi-annually basis (i.e, Second and Fourth Quarters). Beginning in 2000, reports have and continue to be issued on the groundwater monitoring program. All monitoring reports, such as the Quarterly Reports, are available on NMED's website at https://www.env.nm.gov/HWB/kafbperm.htm#KAFBBulkFuelsFacSpill and/or Kirtland website at www.kirtlandjetfuelremediation.com. The Second Quarter 2016 report is currently in Air Force review.

Group 3 (group lead – Sara)
G3-Q1) Brief summary of spill and interventions.

G3-R1)
In November 1999, stained soil was discovered at the ground surface, above the underground transfer pipes near the fuel offloading rack at the BFF.

Soil Excavation Interim Measures

- In total, 4,822 tons of fuel contaminated soil was removed from the source area at the BFF site:
    - 1999/2000 - removal of approximately 120 tons of contaminated surface soil at the former fuel offloading rack (FFOR) area
    - 2010 - removal of approximately 1,018 tons of contaminated soil with underground transfer piping infrastructure below FFOR area and between the FFOR area and pump house
    - 2014 - removal of approximately 3,684 tons of contaminated soil along former pipelines that were below and above ground

Soil Vapor Extraction (SVE) Interim Measures

- Removed more than 550,000 gallons of fuel from the vadose zone, which extends 60 feet below ground surface (bgs) to 450 feet bgs and is just above the water table (approximately 480 feet bgs) using SVE technology at various SVE well locations in the on-Base BFF area:
    - 2003 to 2012 - first SVE system using a combustion engine (ICE) to destroy vapor hydrocarbons was connected to nine SVE wells in FFOR area
    - 2012 - three additional ICE SVE systems were connected to different SVE well locations
    - 2013 to 2015 - expansion of vacuum and destruction capabilities using a Catalytic Oxidizer (CATOX) SVE system along with optimization at different SVE well locations
- The SVE system also helped naturally occurring bacteria to breakdown the fuel contaminants, resulting in at least 200,000 gallons of fuel being biodegraded in the vadose zone over that 12 year period

LNAPL Interim Measures

- 2007 to 2008 - implementation of the skimmer system to vacuum the floating fuel on the groundwater table
- 2008/2009 to 2011 - SVE implementation as a bioslurping technology by adding three additional ICE units to remove floating LNAPL at existing groundwater monitoring wells (KAFB-1065, KAFB-1066, and KAFB-1068)

Groundwater Interim Measures

- June to December 2015 - implementation of temporary groundwater treatment systems (GWTS) to extract and treat dissolved EDB groundwater in the distal end, or northern end of the EDB plume
- December 2015 to present - operational full scale GWTS and expansion of number of extraction wells along with treatment capacity to extract and treat the EDB plume

G3-Q2) Overall health affects/trends of spill related illness.? **

G3-R2)

As there is no mechanism for exposure in the residential areas, there is no effect on human health related to this fuel leak. For more details see the KAFB Fuel Leak Exposure and Risk Dashboard and the Garden Information Sheet (Attachments C and D).

In addition, the RCRA Facility Investigation (RFI) Report will include a risk assessment for human health and the environment and is anticipated to be submitted to NMED in late 2016. This document will also identify all possible contaminant pathways to people and the environment. A risk assessment evaluates site data against possible pathways using the NMED Risk Assessment Guidance (https://www.env.nm.gov/HWB/documents/SSLs_RA_Guidance_for_SI_and_Remediation_July_2015.pdf). This document provides a conservative road map for the Air Force to evaluate potential risk.

G3-Q3) Anticipated length of time of the extraction process?

G3-R3)

At the July public meeting, the project team presented the first line of evidence that the extraction well locations are drawing down the distal, or northern, end area of the EDB plume. For the dissolved EDB plume, it is estimated that a pump and treat system would need to run for approximately 10

years to capture the EDB plume, reduce EDB mass, and reduce the EDB footprint. This 10-year estimation is based on modeling using environmental characteristics and site data. There is a video animation of the modeling used to capture the EDB plume, reduce EDB mass, and reduce the EDB footprint that can be found on project websites and on YouTube (http://youtu.be/Ys8iuWrdJsA). After the system has operated for a period of time, the model will be revisited to determine if the project is on target.

G3-Q4) Clarify methods behind treatment & who is funding?

G3-R4)
All methods being considered for clean-up of the site are determined by proven technologies, success at other sites, and site data. The project is still in the "interim measures" phase, so all methods currently in place and being proposed are tested for effectiveness at this site. For more on interim measures, please see G3-R1 and on the four phases of fuel contamination in the environment, please see G1-R3.

Funding for the cleanup is provided to Congress by the taxpayers. Congress then appropriates funding to the Air Force under the Environmental Restoration Account and cannot be moved for other uses. The Air Force is committed to funding this site to satisfy the RCRA Hazardous Waste Permit and in accordance with state and federal environmental and health regulations.

G3-Q5) Who is the team/leader in charge?

G3-R5)
The core team is NMED, Air Force (Secretary of the Air Force and Air Force Civil Engineer Center [AFCEC]), USACE, Water Utility Authority, City of Albuquerque, and EPA Region 6.

The NMED is the primary regulatory authority for this site's corrective action under the RCRA Hazardous Waste Treatment Facility Operating Permit EPA ID No. NM9570024423 (Permit). KAFB is the responsible party for performing the site's corrective action. The AFCEC is actively doing the remediation work and are using the USACE as the Air Force service provider along with using a wide variety of expert contractors.

Air Force Team Leads:
- Kate Lynnes, Senior Advisor for project; works at KAFB, reports to the Pentagon
- Adria Bodour, PhD, Technical Lead, works at AFCEC, San Antonio, TX

New Mexico Environment Department Leads:
- Dennis McQuillan, PG, NMED Chief Scientist, Santa Fe office
- Diane Agnew, PG, Technical Lead, Albuquerque office

There are many entities involved in the project including the City of Albuquerque, Water Utility Authority, EPA Region 6, USGS and multiple project contractors. The USACE is responsible for oversight of the Air Force Contractors and providing technical expertise. The table below shows project partners and their roles. It is also available online at:
https://www.env.nm.gov/kafbfuelplume/fafb-fuel-plume-partners/

Regulatory Entities	*Responsible Party*	*Key Stakeholder Entities*
<u>New Mexico Environment Department</u> • RCRA Hazardous Waste Permits • Ground Water Permits <u>City of Albuquerque</u> • Environmental, infrastructure, & safety permits <u>New Mexico Office of the State Engineer</u> <u>U.S. Environmental Protection Agency (EPA)</u> acting in an advisory capacity	<u>Air Force</u> • KAFB holds the RCRA Hazardous Waste Permit and all other permits as issued	• Water Utility Authority • Neighborhood Associations & Residents above and adjacent to the plume
Project Contractors to NMED	*Project Contractors To AFCEC*	*Project Contractors To WUA*
• Thomson and Associates (on contract from 6/1/2015 thru 6/30/2016).	• AECOM • AGEISS • CB&I Federal Services • Cherokee • Colorado State University • EA Engineering • Neptune and Company • NewFields Government Services • Noblis • Portage • Sundance Consulting • USACE (oversees contracts for AFCEC) • USGS	• Intera (Nov 2010 to July 2016)
	Other Project Partners • New Mexico Tech •	

Helpful References and Additional Links:

- Air Force project website: http://www.kirtlandjetfuelremediation.com/
  - Includes:

- ATSDR, 2014. Health Consultation, Evaluation of Potential Exposures: Bulk Fuels Facility Groundwater Plume, Kirtland Air Force Base, Albuquerque, New Mexico. http://www.atsdr.cdc.gov/HAC/pha/KirtlandAirForceBase/Kirtland%20AFB%20(Bulk%20Fuels%20Facility)_HC_08-14-2014_508.pdf

- NMED project website: https://www.env.nm.gov/kafbfuelplume/
  - Includes: project history & timeline, project schedule & activities, remediation strategies, site characterization, documents, public outreach information, and photos/videos.

- NMED 2016 Strategic Plan – Kirtland Air Force Base Fuel Leak: https://www.env.nm.gov/NMED/Issues/KirtlandFuelPlume/documents/KAFB2016StrategicPlan_Version2.0_Final.pdf

- July 14, 2016 KAFB/NMED Joint Public Meeting – update presentation slides

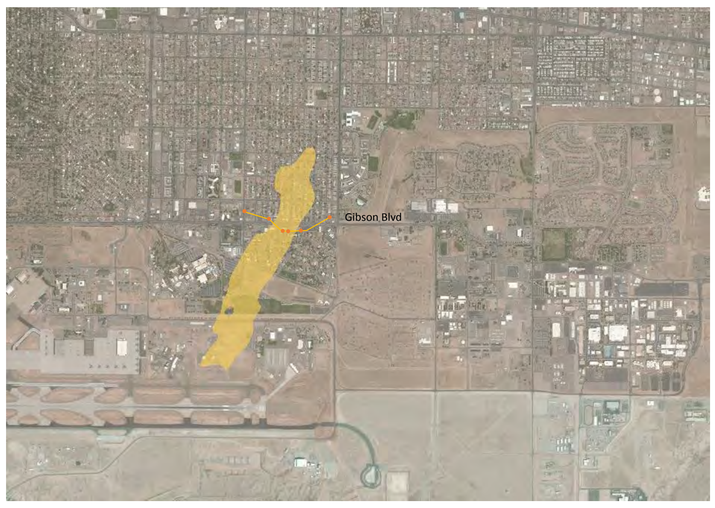
- August 13, 2016 Community Conversation – technical reference slides

Attachments:
A) Posters 1-4 from the April 2016 public meeting
B) Map of extraction wells and full pump & treat system
C) Risk and Exposure Dashboard
D) Garden Information Sheet

Attachment A

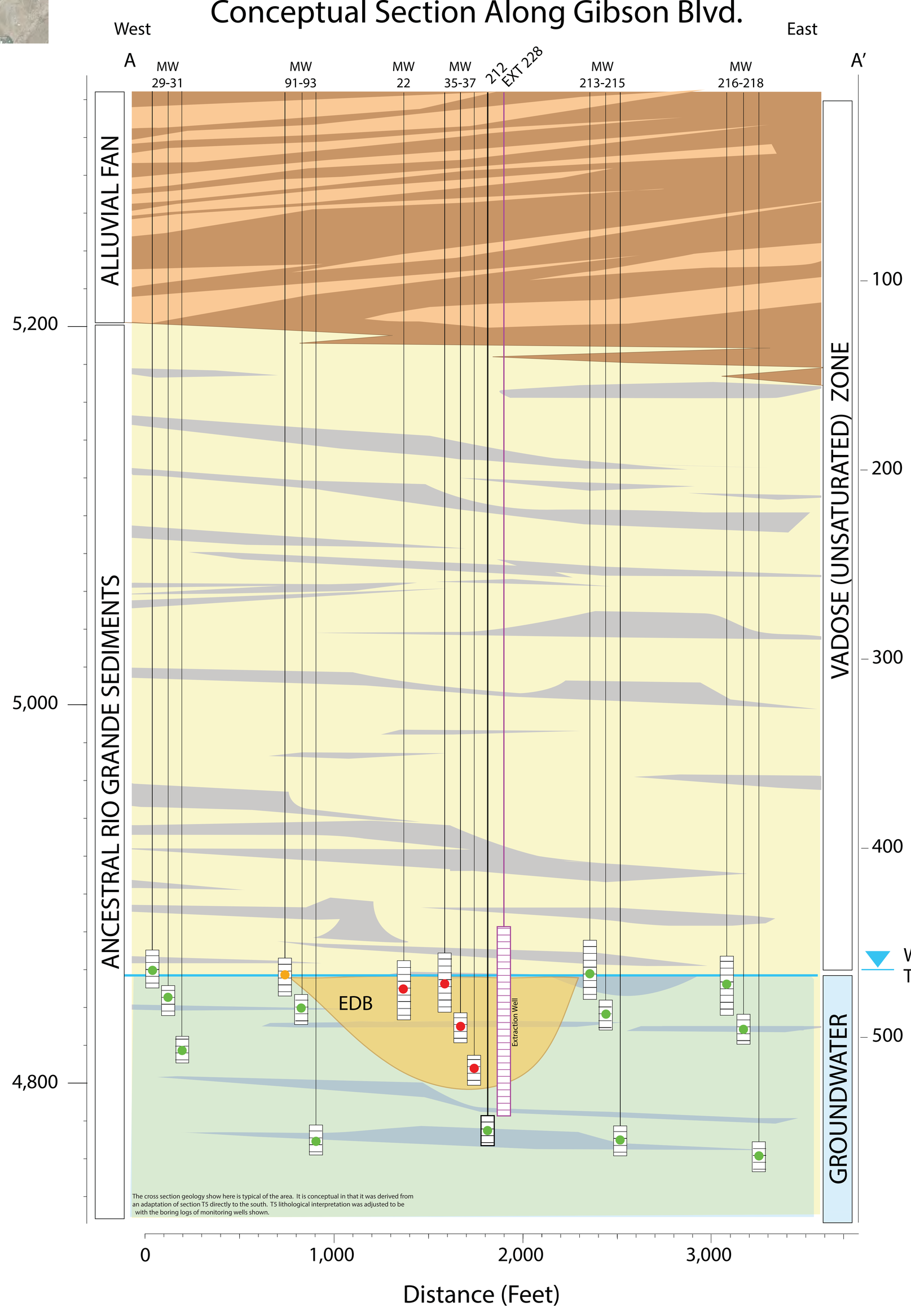
Posters 1-4 from the April 2016 public meeting

Defining the Subsurface:
Gibson Transect, First Extraction Well



Quarter 4 2015 Plume Map

Conceptual Section Along Gibson Blvd.

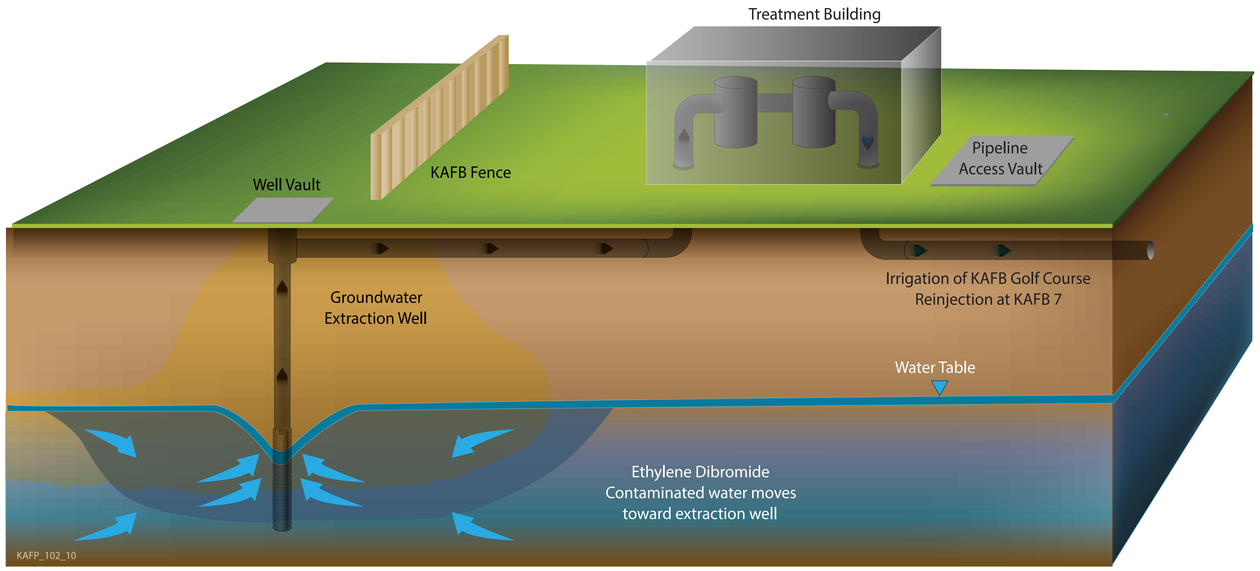


Conceptual Cross Section Key

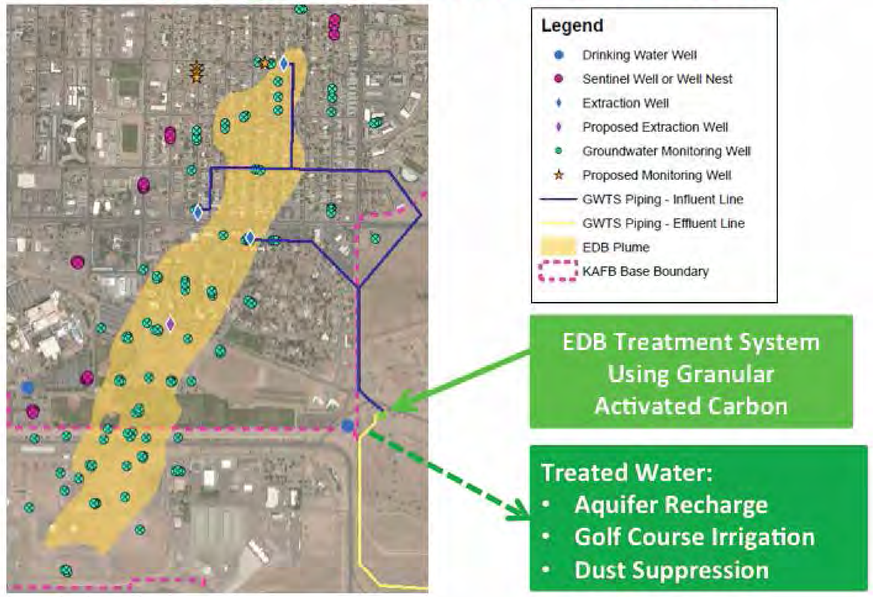
- Alluvial Fan Sediments
  - High Permeability
  - Low Permeability
- Ancestral Rio Grande Sediments
  - High Permeability
  - Low Permeability
- EDB Plume

Groundwater Treatment System

Example of a Pump & Treat System

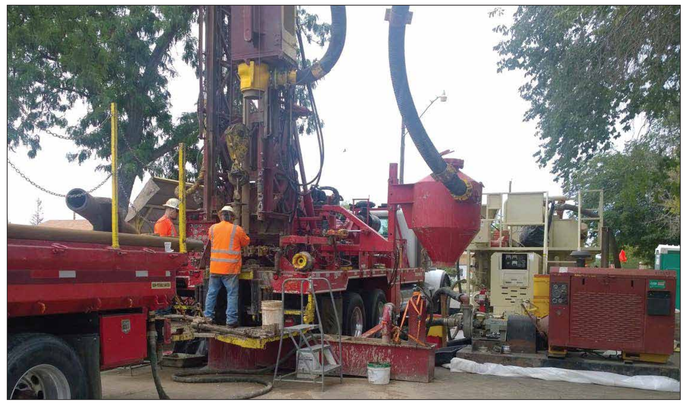


Collapsing the Dissolved EDB Plume



Quarter 4 2015 Sampling Results

Well 234 Driller inserting bit into well



Well 234 Drilling well in mud mode

Looking at split spoon for lithologic description

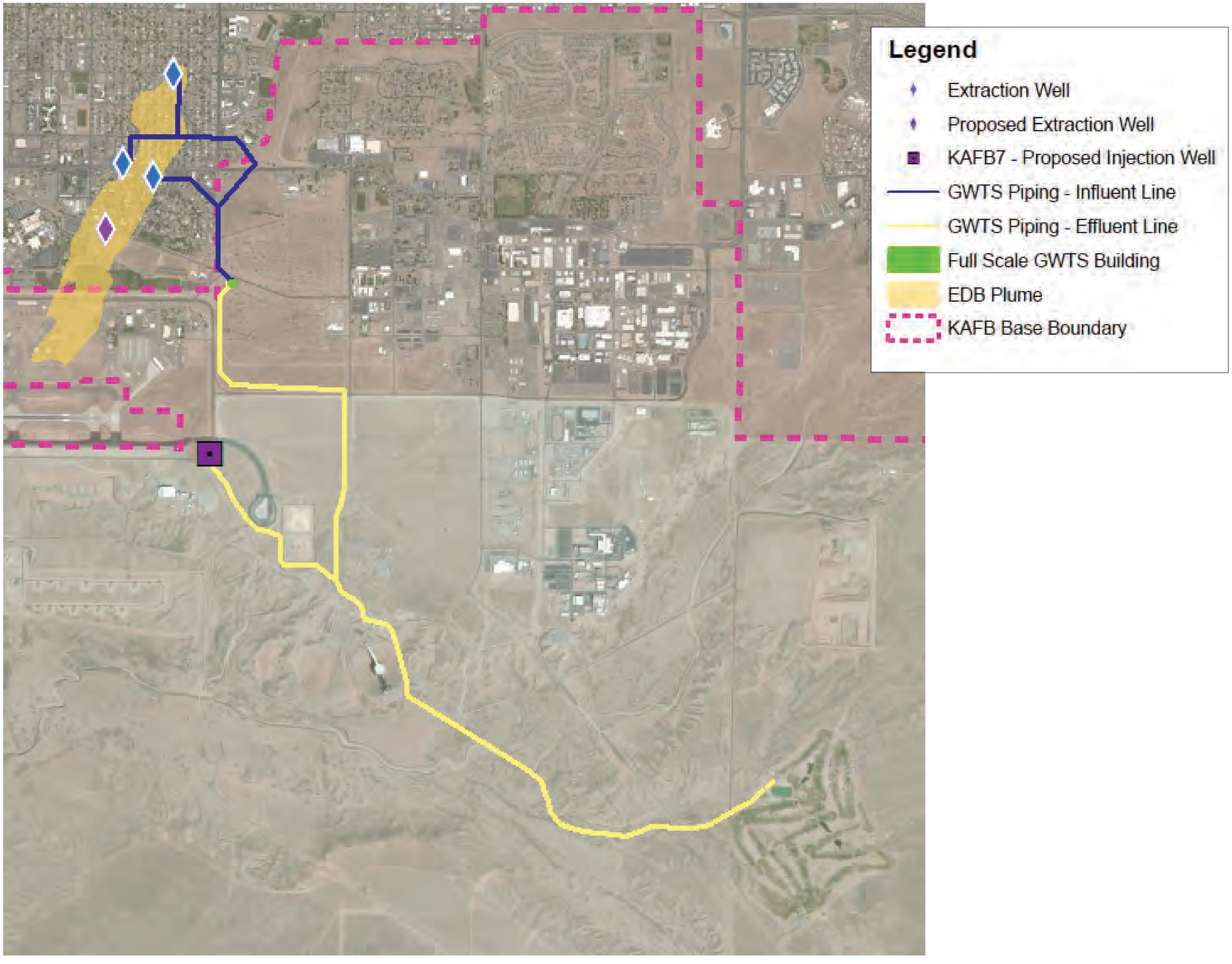
Directional drilling for installation of underground HDPE piping from extraction well KAFB-106228 to Kirtland AFB.

The GWTS began operation on December 31,2015 with all three extraction wells. The full-scale GWTS consists of an influent holding tank, bag filters, two-20,000 pound vessels containing granular activated carbon, and a treated water storage tank.

Fusing of the HDPE influent piping. This piping is being installed beneath the ground surface and connects the existing valve vault to the full-scale treatment building.

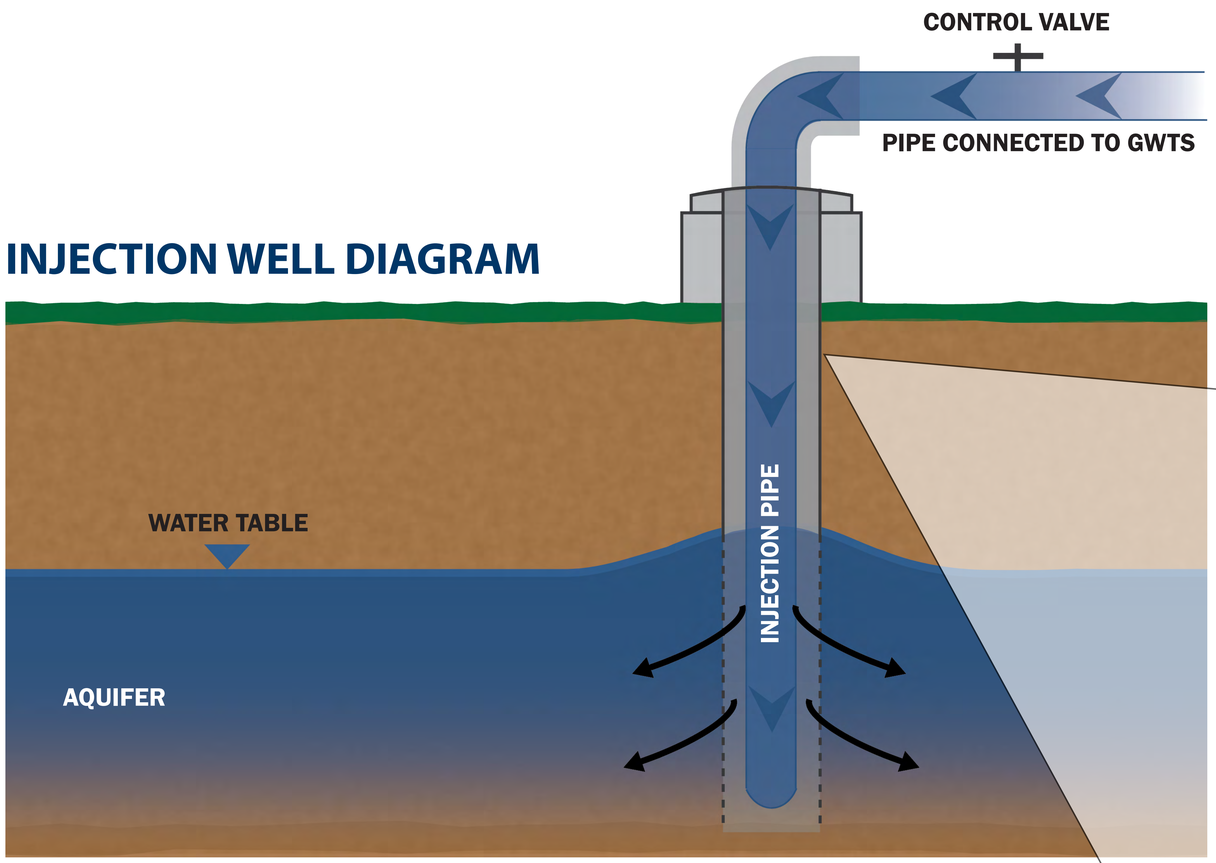
Granular activated carbon tanks used to treat contaminated water extracted from the plume.

Groundwater Treatment System Layout

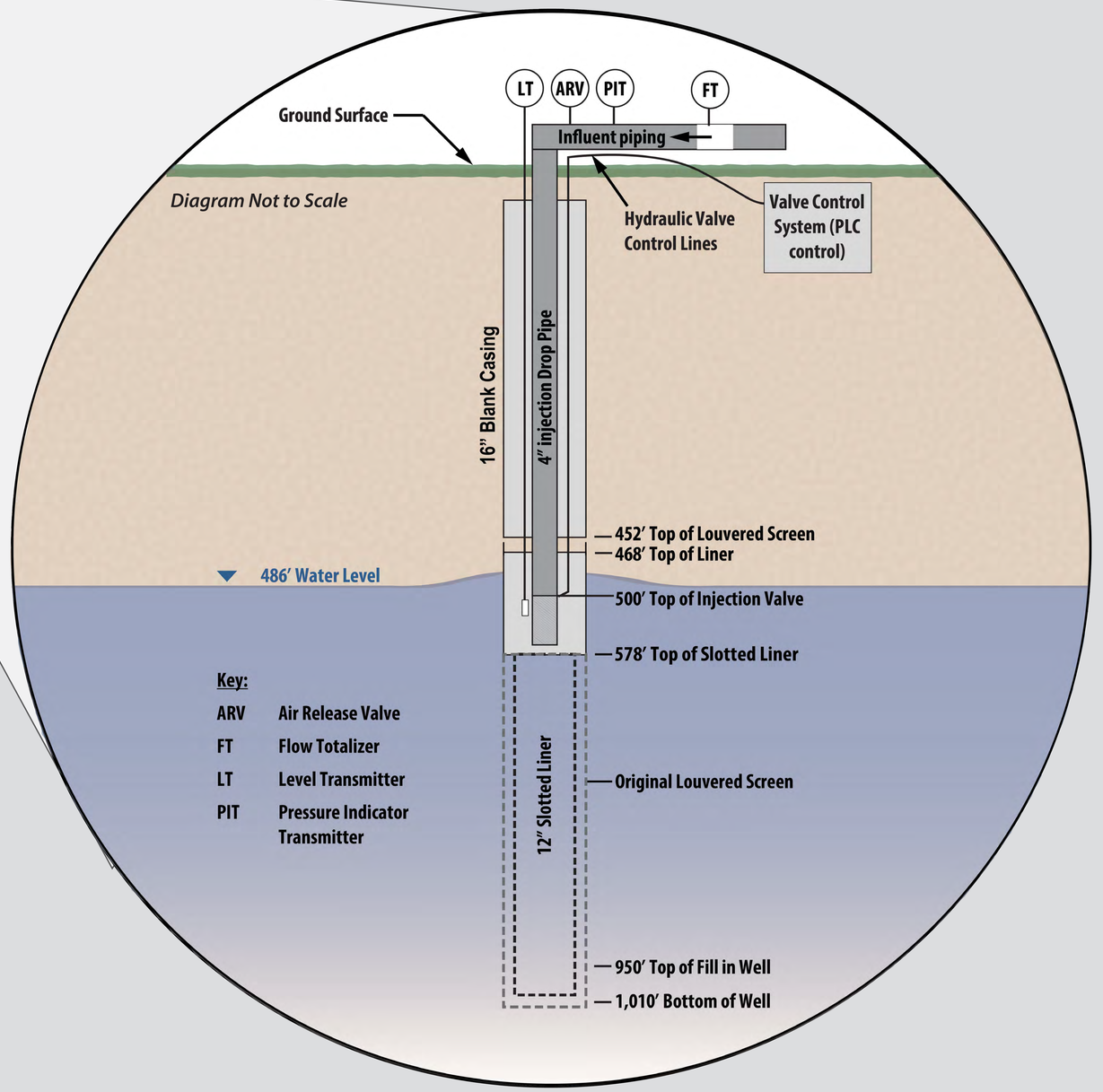


Gravity-Fed Injection of Treated Water

INJECTION WELL DIAGRAM



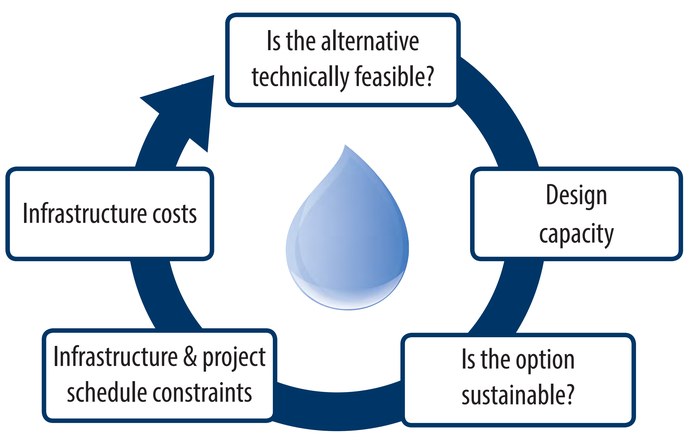
An injection well is used to place fluid underground into aquifers and/or geologic formations. In the case of the Kirtland AFB Bulk Fuels Facility leak project, the injection well is using gravity to drop treated water out of the bottom of a pipe, into the aquifer. The water has been treated to drinking-water quality and becomes part of the water in the aquifer. The volume and rate of water injected is controlled at the Groundwater Treatment System and is monitored with high-accuracy instrumentation to evaluate well and aquifer response to injection.



Beneficial Use of Treated Water

Different options (e.g., infiltration galleries, surface application such as irrigation, retention ponds, injection, etc.) are being considered for discharging water treated at the full-scale groundwater treatment facility.

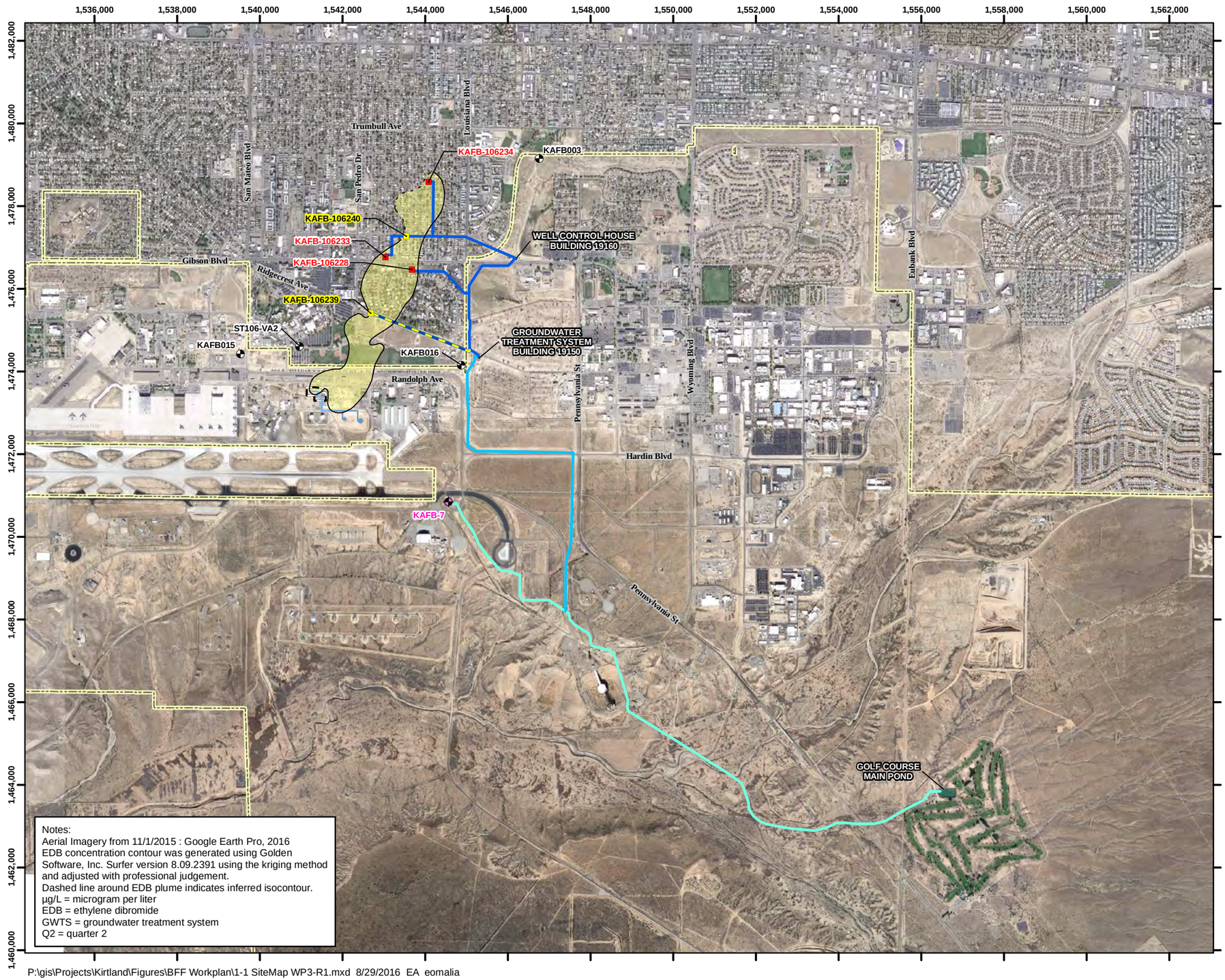
These options are being evaluated using the beneficial reuse criteria below.



Based on our evaluation to date, which includes an understanding of how water moves through soil, two options were identified as viable options for discharging treated water: 1.) use of the Kirtland AFB Golf Course pond to hold water for irrigation use on the golf course; and 2.) a pilot scale test to inject water into the aquifer.

Attachment B

Map of extraction wells and full pump & treat system



Notes:
Aerial Imagery from 11/1/2015 : Google Earth Pro, 2016
EDB concentration contour was generated using Golden Software, Inc. Surfer version 8.09.2391 using the kriging method and adjusted with professional judgement.
Dashed line around EDB plume indicates inferred isocontour.
µg/L = microgram per liter
EDB = ethylene dibromide
GWTS = groundwater treatment system
Q2 = quarter 2

P:\gis\Projects\Kirtland\Figures\BFF Workplan\1-1 SiteMap WP3-R1.mxd 8/29/2016 EA eomalia

Legend

- Extraction Well
- Proposed Extraction Well
- Injection Well KAFB-7
- Drinking Water Supply Well
- GWTS Influent Piping
- GWTS Expansion Influent Piping
- GWTS Effluent Piping
- Piping from KAFB-7 to Golf Course
- EDB Plume in Shallow Zone Aquifer Q2 2016 (> 0.05 µg/L)
- Former Aboveground Storage Tank
- Former Buried Fuel Transfer Line
- Former Aboveground Fuel Transfer Line
- Source Area
- Installation Boundary

Imagery Source: National Agricultural Imagery Program June 2014

Revision Date: 8/29/2016

N

0 1,250 2,500 5,000

Feet

1 inch = 2,500 feet

Projection: NAD83 State Plane New Mexico Central FIPS3002 Feet

WORK PLAN FOR
BULK FUEL FACILITY EXPANSION OF THE DISSOLVED-PHASE PLUME GROUNDWATER TREATMENT SYSTEM DESIGN SOLID WASTE MANAGEMENT UNIT ST-106/SS-111
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 1-1

SITE MAP

Attachment C

Risk and Exposure Dashboard

Kirtland Air Force Base Bulk Fuel Leak
Exposure and Risk Dashboard
August 2016

Risk Levels - This dashboard addresses human exposure and risk based on current monitoring data, and will be updated in the future, if necessary, as new data become available.

Safe	Use Caution	Unsafe

Potential Exposure Pathway	Risk Level	Explanation
Drinking Water		**Drinking water provided by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) continues to be free of any detectable fuel contamination and is safe for all uses.** Public drinking water wells near the groundwater contamination plume are tested monthly, and show no detections of any fuel compounds. Sentinel wells, which are monitoring wells located between the drinking water wells and the contamination plume, are tested quarterly and show no detections.
Surface Soil		**Surface soil contamination never migrated off of Kirtland.** Surface soil contamination has only occurred at the Kirtland Air Force Base Bulk Fuels Facility (BFF) industrial area which is not accessible to the general public. Contaminated soil has been excavated and removed for off-site disposal.
Surface Water		**There is no pathway for contaminants to enter surface water.**
Vapor Intrusion		**Homes and businesses are not at risk for vapor contamination.** There is no off-Base surface or near-surface soil contamination, and groundwater contaminants are too deep, to allow vapors to enter homes and buildings.
Garden Vegetables		**There is no risk of contamination to garden vegetables.** ABCWUA water is safe for irrigation. There is no off-Base surface soil contamination, and vapors from groundwater are too deep, for fuel to contaminate garden vegetables.
Recreational Activities		**There is no risk of contamination to people enjoying recreational activities in Bullhead Park or in the Dog Park.** Reclaimed ABCWUA water is used to irrigate the parks. There is no off-Base surface soil contamination, and vapors from groundwater are too deep, to pose a risk to people in the park areas.

Fuga de Combustible de Carga en la Base de la Fuerza Aérea de Kirtland
Panel de Exposición y Riesgos
Junio 2016

Niveles de Riesgo - Este panel trata de la exposición humana y los riesgos basado en los datos actualizados de monitoreo, y se actualizará en el futuro, si es necesario, a medida que se disponga de nuevos datos.

Seguro	Con precaución	Inseguro

Camino potencial de Exposición	Nivel de Riesgo	Explicación
Agua Potable		**El agua potable suministrada por la Autoridad de Servicios de Agua de Albuquerque Condado de Bernalillo (ABCWUA) sigue estando libre de contaminación de combustible detectable y es segura para todos los usos.** Los pozos públicos de agua potable cerca del penacho de contaminación de agua subterránea se prueban mensualmente, y no muestran detección de ningún compuesto de combustible. Los centinelas de los pozos, que son pozos de monitoreo ubicados entre los pozos de agua potable y el penacho de contaminación, se prueban cada tres meses y no muestran detecciones.
Suelo Superficial		**La contaminación del suelo superficial nunca migró fuera de Kirtland.** La contaminación del suelo superficial sólo ha ocurrido en el área industrial de las Instalaciones de Combustible de Carga de la Base de la Fuerza Aérea de Kirtland (BFF) la cual no es accesible al público en general. La tierra contaminada ha sido excavada y removida para ser eliminada fuera de las instalaciones.
Agua Superficial		**No hay lugar para que los contaminantes entren al agua superficial.**
Intrusión de Vapor		**Los hogares y las empresas no están en riesgo de contaminación de vapor.** No hay contaminación del suelo superficial fuera ni cerca de la Base, y los contaminantes de agua subterránea son demasiado profundos para permitir que los vapores entren en las casas y edificios.
Vegetales de Jardín		**No hay riesgo de contaminación para los vegetales de jardín.** El agua de ABCWUA es segura para el riego. No hay contaminación del suelo superficial fuera de la Base, y los vapores de las aguas subterráneas son demasiado profundos para que el combustible contamine los vegetales de jardín.
Actividades Recreativas		**No hay riesgo de contaminación para las personas que disfrutan de actividades recreativas en el Bullhead Park o en el Dog Park.** El agua recuperada de ABCWUA se utiliza para el riego de los parques. No hay contaminación del suelo superficial fuera de la Base, y los vapores de las aguas subterráneas son demasiado profundos para poner en riesgo a las

		personas en las áreas del parque.

Translation Cloud LLC
121 Newark Ave., 3rd Floor
Jersey City, NJ 07302
1 (800) 790-3680

Project Manager: Kavita Ramgahan
Document Translation
Translation from English to Spanish
June 9, 2016

Kirtland Air Force Base Bulk Fuel Leak
Exposure and Risk Dashboard
August 2016

Risk Levels - This dashboard addresses human exposure and risk based on current monitoring data, and will be updated in the future, if necessary, as new data become available.

Safe	Use Caution	Unsafe

Potential Exposure Pathway	Risk Level	Explanation
Drinking Water		**Drinking water provided by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) continues to be free of any detectable fuel contamination and is safe for all uses.** Public drinking water wells near the groundwater contamination plume are tested monthly, and show no detections of any fuel compounds. Sentinel wells, which are monitoring wells located between the drinking water wells and the contamination plume, are tested quarterly and show no detections.
Surface Soil		**Surface soil contamination never migrated off of Kirtland.** Surface soil contamination has only occurred at the Kirtland Air Force Base Bulk Fuels Facility (BFF) industrial area which is not accessible to the general public. Contaminated soil has been excavated and removed for off-site disposal.
Surface Water		**There is no pathway for contaminants to enter surface water.**
Vapor Intrusion		**Homes and businesses are not at risk for vapor contamination.** There is no off-Base surface or near-surface soil contamination, and groundwater contaminants are too deep, to allow vapors to enter homes and buildings.
Garden Vegetables		**There is no risk of contamination to garden vegetables.** ABCWUA water is safe for irrigation. There is no off-Base surface soil contamination, and vapors from groundwater are too deep, for fuel to contaminate garden vegetables.
Recreational Activities		**There is no risk of contamination to people enjoying recreational activities in Bullhead Park or in the Dog Park.** Reclaimed ABCWUA water is used to irrigate the parks. There is no off-Base surface soil contamination, and vapors from groundwater are too deep, to pose a risk to people in the park areas.

Rò rỉ Kho Nhiên liệu Căn cứ Không quân Kirtland
Bảng Rủi ro và Phơi nhiễm
Tháng 06/2016

Cấp độ Rủi ro - Bảng này xét đến tình trạng phơi nhiễm và rủi ro cho người dựa trên các dữ liệu đang được giám sát, và sẽ được cập nhật trong tương lai, nếu cần thiết, khi các dữ liệu mới được cung cấp.

An toàn	Cẩn thận	Không an toàn

Đường Phơi nhiễm Tiềm năng	Cấp độ Rủi ro	Giải thích
Nước uống		**Nước uống được cung cấp bởi Cơ quan Dịch vụ Nước Hạt Albuquerque Bernalillo (ABCWUA) vẫn tiếp tục không chứa bất kỳ loại ô nhiễm nhiên liệu nào có thể được phát hiện và an toàn cho mọi mục đích sử dụng.** Các giếng nước uống công cộng gần vết loang ô nhiễm nước ngầm đều được kiểm tra hàng tháng, và không phát hiện bất kỳ hợp chất nhiên liệu nào. Các giếng bảo vệ, là các giếng có mục đích giám sát được đặt giữa giếng nước uống và vết loang ô nhiễm được kiểm tra hàng quý và không phát hiện dấu hiệu nào.
Đất bề mặt		**Ô nhiễm đất bề mặt chưa bao giờ lan ra khỏi Kirtland.** Ô nhiễm đất bề mặt chỉ xảy ra tại khu công nghiệp Kho Nhiên liệu (BFF) của Căn cứ Không quân Kirtland là khu vực không cho phép công chúng tiếp cận. Đất ô nhiễm đã được đào và mang đi tiêu hủy ngoài khu vực.
Nước bề mặt		**Không có đường nào để chất ô nhiễm lẫn vào nước bề mặt.**
Hơi nước xâm hại		**Nhà cửa và doanh nghiệp không có nguy cơ bị ô nhiễm hơi nước.** Không có hiện tượng ô nhiễm đất bề mặt hoặc gần bề mặt xảy ra ngoài Căn cứ, và các chất ô nhiễm nước ngầm ở quá sâu để hơi nước có thể vào được nhà cửa và các tòa nhà.
Rau trong vườn		**Không có rủi ro ô nhiễm nào đối với các cây rau trồng trong vườn.** Nước của ABCWUA đủ an toàn cho tưới tiêu. Không có hiện tượng ô nhiễm đất bề mặt xảy ra ngoài Căn cứ, và hơi nước từ mạch nước ngầm ở quá sâu nên nhiên liệu không thể làm ô nhiễm cho rau trồng trong vườn.
Các hoạt động giải trí		**Không có rủi ro ô nhiễm nào đối với người tham gia các hoạt động giải trí ở Công viên Bullhead hoặc Công viên Chó.** Nước ABCWUA tái chế được sử dụng để tưới cây trong công viên. Không có hiện tượng ô nhiễm đất bề mặt xảy ra ngoài Căn cứ, và hơi nước từ mạch nước ngầm ở quá sâu nên không có rủi ro nào đối với

		người trong khu vực công viên.

Attachment D

Garden Information Sheet

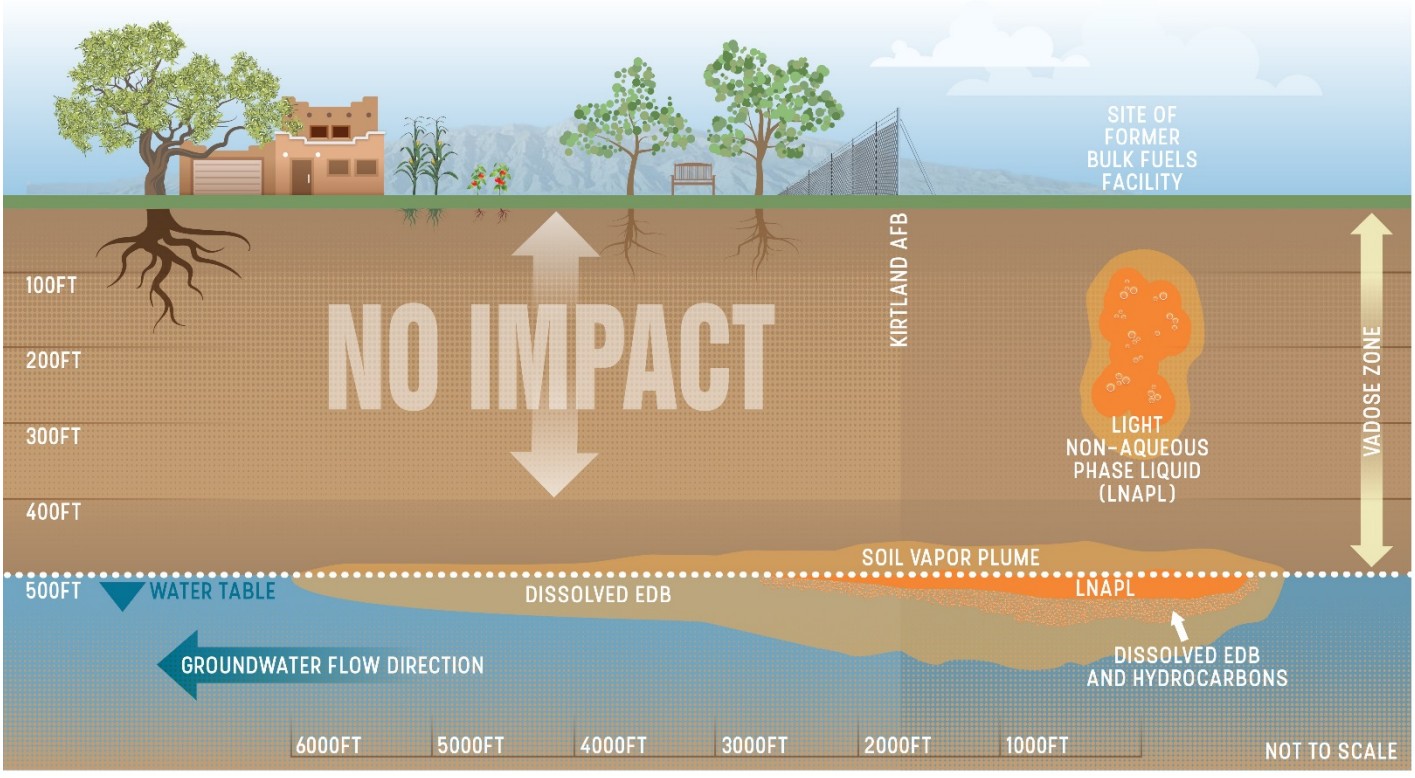
Garden Information Sheet

Thank you for your interest in the Kirtland Air Force Base (AFB) Bulk Fuels Facility (BFF) cleanup project. This update is to share information with Kirtland AFB's neighbors about gardening as we head into spring. The most common question asked of people working on the project is, "Is it safe to garden?" As is explained below, the answer is "Yes."

As you may know, in 1999, an underground, intermittent leak was identified at the fuel facility on Kirtland AFB. The leak was discovered when jet fuel was identified in surface soil at the facility. Over time, the fuel moved down through the soil and reached the groundwater underneath the base, and then moved in a plume north-northeast with the groundwater in a narrow corridor under neighborhoods immediately off base. To date, no fuel-related chemicals have been identified in the drinking water provided to Albuquerque residents. Drinking water production wells are sampled monthly with no detections of fuel-related contaminants. Since June 2015, the pump and treat interim measure has been operating to extract and treat EDB-contaminated groundwater. This system will further reduce the EDB plume concentrations in residential areas.

Below are some facts related to this release and how it may affect you as a neighbor to Kirtland AFB:

- Fuel from the Air Force did not leak at the ground surface in residential areas or parks neighboring the base.
- Fuel contains compounds, some of which can change to a vapor form. The ability for a fuel compound to cause a vapor concern near the surface is dependent on a number of factors such as the concentration of the fuel compound, the depth to the plume, and the types of soil (e.g. cobblestones, sand, silt and/or clays). It is a combination of these factors that we assess to determine if the ethylene dibromide (EDB) plume affects the residential areas above the plume. Based on what we know of these factors, there is no threat of vapor reaching the ground surface.
    - EDB-measured concentrations within residential areas of groundwater are consistently low. These low concentrations limit the amount of EDB vapor that can form in soil air spaces above the groundwater.
    - The EDB plume in residential areas is 455 to 480 feet below the ground surface.
    - Residential soil types are made up of cobblestones, sand, silt, and/or clays which work together to prevent any EDB vapors from reaching the ground surface.
- Most garden plants have roots that are only in the top 3 to 6 feet of soil. Trees have deeper roots. For example, junipers in this area have the deepest roots which can go down to 131 feet; whereas, an apple tree can go down to 10 feet. Therefore, no impacts to residential gardening are possible.



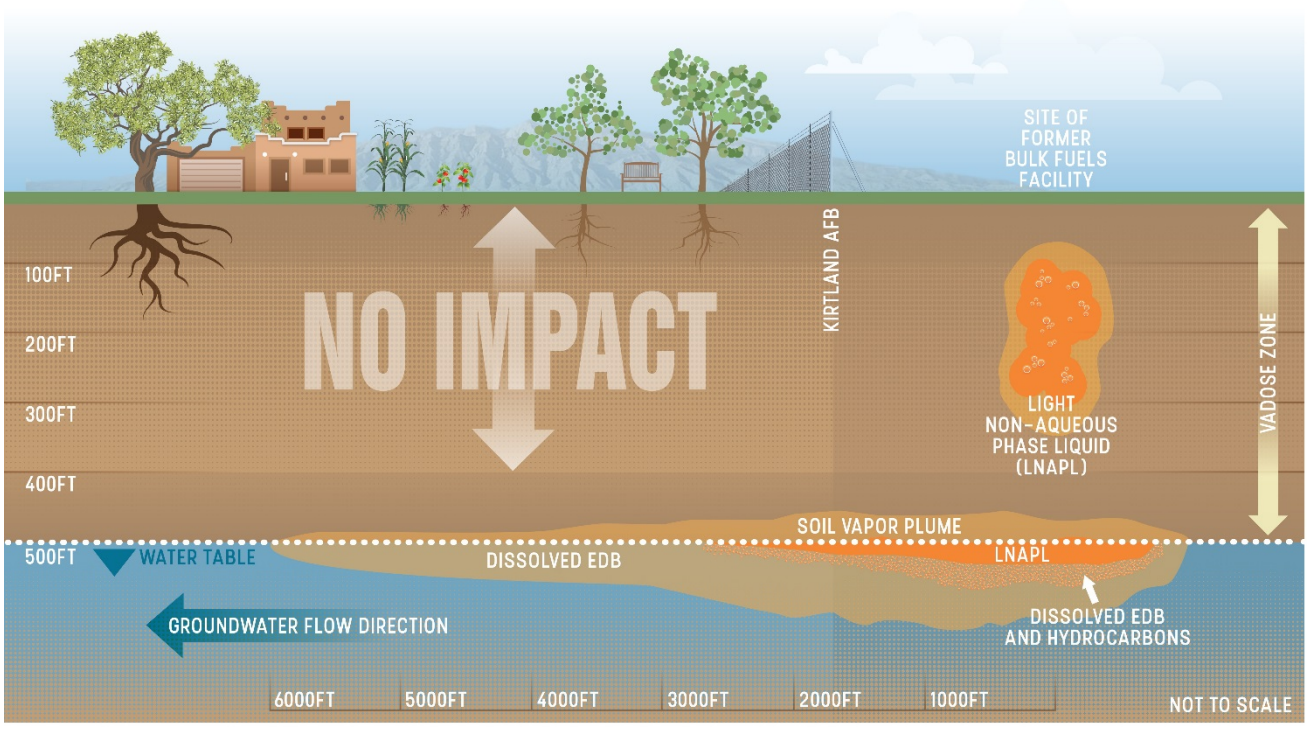
Hoja de información de jardín

Gracias por su interés en nuestro proyecto de limpieza en las Instalaciones de Combustible a Granel (ICG) de la Base de la Fuerza Aérea (BFA). Esta actualización es para compartir información con los vecinos de la BFA sobre jardinería, ya que nos acercamos a la primavera. La pregunta más común de las personas que trabajan en el proyecto es, "¿La jardinería es segura?" Tal y como se explica a continuación la respuesta es "Si".

Como usted debe saber, en 1999, una fuga subterránea intermitente fue identificada en las instalaciones de combustible en BFA Kirtland. La fuga fue descubierta cuando se detectó combustible para aviones en la superficie del suelo de las instalaciones. Con el tiempo, el combustible bajó por el suelo y alcanzó el agua subterránea debajo de la base, y luego se desplazó en un penacho norte-noreste con el agua subterránea en un estrecho corredor debajo de los vecindarios cercanos a la base. Hasta la fecha, ningún químico relacionado con el combustible ha sido identificado en el agua potable suministrada a los residentes de Albuquerque. Los pozos de producción de agua potable son muestreados mensualmente y no hay detecciones de los contaminantes relacionados con el combustible. Desde junio de 2015, la medida cautelar de bombeo y tratamiento ha estado operando para extraer y tratar el agua subterránea contaminada-EDB. Este sistema reducirá aún más las concentraciones de penachos EDB en zonas residenciales.

A continuación se presentan algunos hechos relacionados con este comunicado y cómo esto lo puede afectar como vecino de BFA Kirtland:

- El combustible de la Fuerza Aérea no se fugó en la superficie de zonas residenciales o parques cercanos a la base.
- El combustible contiene compuestos, algunos de los cuales pueden cambiar a una forma de vapor. La posibilidad para que un compuesto de combustible pueda causar una preocupación de vapor cerca de la superficie depende de un número de factores tales como la concentración del compuesto de combustible, la profundidad del penacho, y el tipo de suelo (por ejemplo: adoquines, arena, limo y/o arcillas). Es una combinación de estos factores que evaluamos para determinar si el penacho de dibromuro de etileno (DE) afecta las zonas residenciales por encima del penacho. Basado en lo que conocemos de estos factores, no hay amenaza de que el vapor llegue a la superficie.
  - Las concentraciones medidas con DE dentro de las zonas residenciales son consistentemente bajas. Estas bajas concentraciones limitan la cantidad de vapor DE que se pueda formar en los espacios de aire del suelo que está por encima del agua subterránea.
  - El penacho DE en las zonas residenciales está de 455 a 480 pies por debajo de la superficie del suelo.
  - Los suelos de las zonas residenciales están compuestos de adoquines, arena, limo y/o arcillas los cuales trabajan de manera conjunta para prevenir que cualquier vapor DE alcance la superficie del suelo.
- La mayoría de las plantas de jardín tienen raíces que bajan de 3 a 6 pies en el suelo. Los árboles tienen raíces más profundas. Por ejemplo, los enebros en esta área tienen las raíces más profundas que pueden ir hasta 131 pies; mientras que, un árbol de manzanas puede bajar hasta 10 pies. Por lo tanto, no es posible que haya impacto en la jardinería residencial.



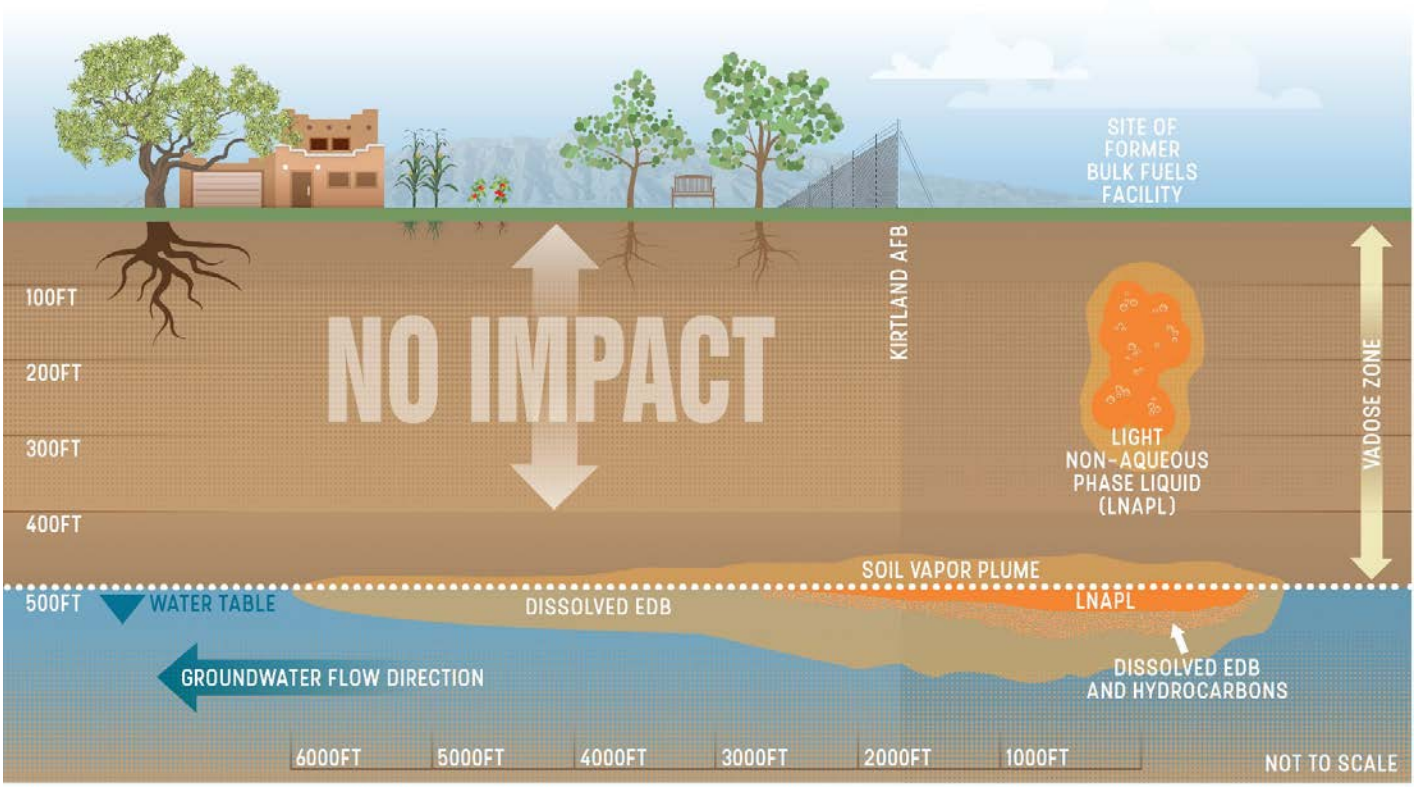
Garden Information Sheet

Thank you for your interest in the Kirtland Air Force Base (AFB) Bulk Fuels Facility (BFF) cleanup project. This update is to share information with Kirtland AFB's neighbors about gardening as we head into spring. The most common question asked of people working on the project is, "Is it safe to garden?" As is explained below, the answer is "Yes."

As you may know, in 1999, an underground, intermittent leak was identified at the fuel facility on Kirtland AFB. The leak was discovered when jet fuel was identified in surface soil at the facility. Over time, the fuel moved down through the soil and reached the groundwater underneath the base, and then moved in a plume north-northeast with the groundwater in a narrow corridor under neighborhoods immediately off base. To date, no fuel-related chemicals have been identified in the drinking water provided to Albuquerque residents. Drinking water production wells are sampled monthly with no detections of fuel-related contaminants. Since June 2015, the pump and treat interim measure has been operating to extract and treat EDB-contaminated groundwater. This system will further reduce the EDB plume concentrations in residential areas.

Below are some facts related to this release and how it may affect you as a neighbor to Kirtland AFB:

- Fuel from the Air Force did not leak at the ground surface in residential areas or parks neighboring the base.
- Fuel contains compounds, some of which can change to a vapor form. The ability for a fuel compound to cause a vapor concern near the surface is dependent on a number of factors such as the concentration of the fuel compound, the depth to the plume, and the types of soil (e.g. cobblestones, sand, silt and/or clays). It is a combination of these factors that we assess to determine if the ethylene dibromide (EDB) plume affects the residential areas above the plume. Based on what we know of these factors, there is no threat of vapor reaching the ground surface.
    - EDB-measured concentrations within residential areas of groundwater are consistently low. These low concentrations limit the amount of EDB vapor that can form in soil air spaces above the groundwater.
    - The EDB plume in residential areas is 455 to 480 feet below the ground surface.
    - Residential soil types are made up of cobblestones, sand, silt, and/or clays which work together to prevent any EDB vapors from reaching the ground surface.
- Most garden plants have roots that are only in the top 3 to 6 feet of soil. Trees have deeper roots. For example, junipers in this area have the deepest roots which can go down to 131 feet; whereas, an apple tree can go down to 10 feet. Therefore, no impacts to residential gardening are possible.



BẢNG THÔNG TIN VỀ LÀM VƯỜN

Cảm ơn quý vị đã quan tâm đến dự án làm sạch Kho Nhiên liệu (BFF) của Căn cứ Không quân Kirtland (AFB). Bản cập nhật này nhằm chia sẻ thông tin với cư dân sinh sống quanh Căn cứ Kirtland AFB về dự án làm vườn trong mùa xuân này. Câu hỏi thường gặp nhất của những người tham gia dự án là: "Liệu có đủ an toàn để làm vườn hay không?" Như chúng tôi giải thích dưới đây, câu trả lời là "Có."

Như quý vị đã biết, vào năm 1999, một vụ rò rỉ kéo dài dưới lòng đất đã được phát hiện tại kho nhiên liệu của Căn cứ Kirtland AFB. Vụ rò rỉ được phát hiện khi chúng tôi tìm thấy mặt đất ở cơ sở này có trộn lẫn với nhiên liệu máy bay. Theo giời gian, nhiên liệu ngấm xuống đất và nhiễm vào mạch nước ngầm dưới căn cứ, sau đó lan về hướng Bắc - Đông Bắc theo mạch nước ngầm qua một vách hẹp bên dưới các khu dân cư cạnh căn cứ. Cho đến nay, không có bất kỳ loại hóa chất nào liên quan đến nhiên liệu được phát hiện trong nguồn nước uống cung cấp cho cư dân Albuquerque. Các giếng nước uống đều được lấy mẫu hàng tháng và không phát hiện các chất gây ô nhiễm do nhiên liệu. Kể từ tháng 6 năm 2015, biện pháp bơm và xử lý tạm thời đã được thực hiện để khai thác và xử lý nguồn nước ngầm bị ô nhiễm EDB. Hệ thống này sẽ giúp giảm thiểu lan tỏa nồng độ EDB trong các khu dân cư.

Dưới đây là một vài dữ kiện liên quan đến ấn bản này và cách nó có thể ảnh hưởng đến quý vị, với tư cách là hàng xóm của Căn cứ Kirtland AFB:

- Nhiên liệu từ Lực lượng Không quân không bị rò rỉ trên mặt đất trong các khu dân cư hoặc công viên lân cận.
- Nhiên liệu chứa các hợp chất, một trong số đó có thể chuyển sang thể khí. Khả năng một hợp chất nhiên liệu có thể gây ra lo ngại về chất khí gần mặt đất phụ thuộc vào nhiều yếu tố như nồng độ của hợp chất nhiên liệu, độ sâu đến vết loang, và loại đất (ví dụ như đá sỏi, cát, bùn và/hoặc đất sét). Dựa vào các yếu tố này, chúng tôi đánh giá để xác định xem liệu vết loang ethylene dibromide (EDB) có ảnh hưởng đến các khu dân cư ở trên vết loang hay không. Dựa trên những gì chúng tôi biết về những yếu tố này, không có mối đe doạ nào về khí bay lên mặt đất.
    - Nồng độ EDB đo được ở các mạch nước ngầm trong khu vực cư dân luôn thấp. Nồng độ thấp này giúp giới hạn lượng khí EDB hình thành trong khoảng trống của đất trên mạch nước ngầm.
    - Vết loang EDB trong khu dân cư nằm cách mặt đất khoảng 455 đến 480 feet (138 mét đến 146 mét).
    - Các loại đất của khu dân cư được hình thành từ đá sỏi, cát, bùn, và/hoặc đất sét hoạt động cùng lúc giúp hạn chế lượng khí EDB thoát lên mặt đất.
- Phần lớn các loại thực vật trong vườn có rễ chỉ sâu từ 3 đến 6 feet (0,9 mét đến 1,8 mét) trong đất. Các loại cây có rễ sâu hơn. Ví dụ, cây bách xù trong vùng này có rễ sâu nhất, đến 131 feet (40 mét); trong khi đó, rễ cây táo có thể sâu đến 10 feet (3 mét). Vì vậy, không thể có tác động nào đến việc làm vườn ở khu dân cư.