Kirtland Air Force Base
Fuel Leak Cleanup

Presenters:
Kathryn Lynnes, Air Force
Diane Agnew, New Mexico Environment Department
Adria Bodour, Air Force Civil Engineer Center

Water Protection Advisory Board
Project Status Update
March 10, 2017
Welcome

Kate Lynnes
Air Force Senior Advisor
# Public Workshop

**March 11, 2017**

9 am to 12:00 pm

Christ United Methodist Church

6200 Gibson Blvd. SE

<table>
<thead>
<tr>
<th>Time</th>
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<tr>
<td>9 - 9:15 am</td>
<td>Meet and Greet along with Poster Session</td>
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<tr>
<td>9:15 - 11:30 am</td>
<td>Workshop Topic Sessions</td>
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<tr>
<td>11:30 - 12:00 pm</td>
<td>Final Discussions and Wrap-up</td>
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A Partnership for Success

A collaborative technical team is solving the complex hydrogeologic and engineering challenges posed by the fuel leak with support from Albuquerque’s neighborhood groups.

Westside Coalition Neighborhood Assoc.

US Army Corps of Engineers

ABQ City Council District 6 Coalition of Neighborhood Assocs.

Elder Homestead Neighborhood Assoc.

Christ United Methodist Church

HAWLEY GEOMATTERS

Thomson and Associates
Project Update

Diane Agnew
New Mexico Environment Department
Hydrologist

Dr. Adria Bodour
Air Force Civil Engineer Center
Environmental Remediation Specialist
# 2016 Strategic Plan


**Goal:** Protect Albuquerque’s aquifer and drinking water supply wells in the area of the fuel leak

**Strategies to Achieve the Goal:**

1. Implement a robust site monitoring & wellhead protection program
2. Characterize and remediate Light Non-Aqueous Phase Liquid (LNAPL), impacted soil, and associated dissolved phases in the source area
3. Collapse the dissolved ethylene dibromide (EDB) plume
4. Meet or exceed all requirements for providing public comment, information and involvement
2016 Strategic Plan Highlights

Strategy #1 Highlights:
- Quarterly monitoring of monitoring well network shows a relatively stable plume
- Sentinel wells show no detections of EDB
- Monthly testing of drinking water supply wells show no detections of any EDB

Strategy #2 Highlights:
- Work plan approval of LNAPL interim measure for in situ bioremediation
- Working group discussions to evaluate data and scope 2017 pilot tests and LNAPL continuous coring locations

Strategy #3 Highlights:
- Treated groundwater contains no detectable fuel constituents
- Expanded groundwater treatment system (GWTS) capacity to 800 gallons per minute (gpm)
- 2-3 extraction wells operational throughout 2016

Strategy #4 Highlights:
- NMED and the Air Force conducted a total of 20 presentations or outreach events
Site Monitoring & Wellhead Protection

Data Gap Wells
KAFB-106235 and KAFB-106236 (installed in 2016)
Installed two data gap groundwater monitoring wells nests

Nested well design provides:
- Better vertical definition
- Reduced impact to neighborhoods
- Installation of “contingency well” to account for continued rising water table

1st samples collected January 2017; no EDB was detected
Groundwater Sampling Optimization

• Collect high quality data while reducing cost, minimizing neighborhood impacts, and increasing worker health and safety

• Data-based iterative process to optimize monitoring program

• Changing to passive diffusion bag (PDB) sampling at 75 residential groundwater monitoring wells
  
  – Pilot test results demonstrated PDB sampling was similar to mechanical pump sampling
EDB Plume Collapse

• 2 extraction wells operational – total rate of 300 gpm

• 151.7 million gallons of groundwater has been treated, with 48.4 grams of EDB removed

Extraction Well KAFB-106233 taken offline in June 2016 due to fouling issues at treatment system

4th Extraction Well KAFB-106239 Completed January 2017

Legend
- Drinking Water Supply Well
- Sentinel Well or Well Nest
- Groundwater Monitoring Well
- Extraction Well
- Q4 2016 Shallow Benzene Plume Footprint
- Q4 2016 Shallow EDB Plume Footprint
- KAFB Base Boundary
Plume Capture Update

Extraction Well KAFB-106234 → 57% of EDB plume captured

Extraction Well KAFB-106233 → 0% of EDB plume captured

Extraction Well KAFB-106228 → 42% of EDB plume captured

Horizontal mass capture analysis at the water table elevation → 99.5% of EDB plume North of Ridgecrest Dr.
Plume Reduction Analysis

Data Demonstrates

- EDB mass is moving towards extraction wells
- Increased mass concentrations at extraction wells
GWTS Expansion

2 New 20,000 pound granular activated carbon (GAC) Tanks added

Sacrificial anode added to extraction wells to prevent corrosion

Addition of Sand Filters Pre-Treatment
KAFB-7 Injection Pilot Test

• Pilot test gravity-fed injection at KAFB-7 from February 20 thru June 21, 2016

• No contaminants in treated effluent

• Initial vs. steady-state operations during injection
  – Groundwater rose with injection into KAFB-7
    • 2-14 feet vs 3-6 feet

• Minimal aquifer response to observation wells surrounding KAFB-7
Air Force has applied for a Class V Underground Injection Control (UIC) discharge permit from the NMED Ground Water Quality Bureau (GWQB) for KAFB-7 and up to four additional UIC wells.

Draft permit was out for public comment which ended on February 13, 2017 for a 90-day public comment period.

Revised draft permit was streamlined and re-posted on March 3, 2017 for an additional 30-day public comment period.

Air Force is currently discharging to KAFB-7 under a Temporary Permission issued by the NMED GWQB.
What’s next for EDB Plume Collapse?

• Rehabilitate and redevelop extraction well KAFB-106233 on California St./Gibson Blvd.

• Design and construct conveyance pipeline from new extraction well KAFB-106239 on Ridgecrest Dr. to GWTS

• Operate GWTS with all 4 extraction wells

• Continue plume capture evaluation through tracking multiple lines of evidence which will feedback to GWTS operations
EDB In Situ Biodegradation Pilot Test

• Field activities began in January 2017

• Drilled and installed two groundwater monitoring well nests

• Drilling extraction wells; one extraction well installed

• Pilot test Phase 1 target start date May 2017
Air Force officially submitted the RFI Report on January 31, 2017:

- Describes nature and extent of contamination in the soil and groundwater
- Provides a comprehensive evaluation of site data from discovered release 1999 to December 2015
- Follows regulatory process to define nature and extent
- Presents data based on media (soil, vapor, and groundwater)
- Presents the conceptual site model (CSM) showing the fate and transport of contamination through media
Fate and Transport

- Jet fuel in pipe changes when it enters the environment
- Factors and processes that affect jet fuel change
  - Physical (e.g., air, water, soil, advection, diffusion, etc)
  - Chemical (e.g., zinc, sodium, calcium, hydrolysis, etc)
  - Biological (e.g., worms, amoebas, bacteria, biodegradation, etc)
  - Time
  - Complexity
- Jet fuel is composed of many constituents and their behavior in the environment varies
1999/2010/2014 – removed 4,822 tons of contaminated soil to 20 feet below ground surface (bgs)


2001-2012 – installed soil vapor monitoring locations

2003-2015 – interim measures
2000-2016 - Groundwater Monitoring Locations

- Single wells shallow, intermediate, and deep
- New wells designed as nested with up to four wells in one borehole
- Deep sentinel wells
- Performed chemical, geophysical logging, and aquifer testing

2015-present – interim measure
Current Conceptual Site Model

Bioventing interim measure to remediate residual fuel 50 to 300 feet bgs

Air-lift enhanced bioremediation and EDB in situ biodegradation interim measures to remediate trapped LNAPL in low permeability zones above and below water table

Soil coring to understand residual LNAPL in vadose zone/saturated zone
RFI Key Findings

• Fuel contamination nature and extent has been defined for soil, soil vapor, and groundwater

• Underground pipelines associated with former offloading rack were the sources of the jet fuel release

• Data gaps that need to be resolved
  – EDB dissolved-phase plume delineation in the northwest toe of the plume
  – Vertical extent of the LNAPL
RFI Path Forward

• RFI Addendum Report expected 2018 to include:
  – Data from recently installed data gap groundwater monitoring wells
  – Continuous cores from source area to fill LNAPL data gap

• Risk assessment to be submitted as a separate document
Current Project Timeline

2017
- RFI
- Drilling

2018
- RFI Addendum
- Core Sampling and Results
- Site Soil and Groundwater Monitoring Program
- INTERIM CLEANUP MEASURES
  - Vadose Zone: Bioventing Pilot Test
  - LNAPL: Air-lift Enhanced Bioremediation Pilot Test
  - LNAPL: EDB In-Situ Biodegradation Pilot Test
  - Groundwater: EDB Plume Collapse (Groundwater Treatment System)
- Site Permitting

2019
- Corrective Measures Evaluation
- Public Meetings, Field Trips, and Outreach

we are here
NMED Final 2017 Strategic Plan will be posted by the end March 2017 with comments received (www.env.nm.gov/kafbfuelplume)

**Goal:** Protect Albuquerque’s aquifer and drinking water supply wells in the area of the fuel leak

**Strategies to Achieve the Goal:**

1. Implement a robust site monitoring & wellhead protection program
2. Deploy multiple cleanup strategies, both simultaneously and sequentially, to cleanup soil and groundwater
3. Meet or exceed all requirements for providing public comment, information and involvement
What to expect in 2017?

- Continue monitoring soil vapor, groundwater, and drinking water supply wells including rising water levels
- Continue operations of the GWTS
- Obtain continuous cores from source area to address LNAPL data gaps
- Construct EDB in situ bioremediation pilot test
- Design and implement bioventing pilot test to target residual fuel hot spots in vadose zone
- Design and implement air-lift enhanced bioremediation pilot test
- Continued public outreach at public meetings, and with neighborhood associations and various community groups
QUESTIONS

Field Trips

Well installation in neighborhoods

Source Area Cleanup

GWTS
How do I get more information?

Contact NMED:

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<tr>
<th>Name</th>
<th>Title</th>
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NMED Website and Listserv: [www.env.nm.gov/kafbfuelplume](http://www.env.nm.gov/kafbfuelplume)

Contact the Air Force:

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Air Force Bulk Fuels Facility website: [www.kirtlandjetfuelremediation.com](http://www.kirtlandjetfuelremediation.com)