Kirtland Air Force Base
Fuel Leak Cleanup

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

Project Status Update
November 14, 2017
Welcome

Kate Lynnes
Air Force Senior Advisor
Col Nickell
Air Base Vice-Wing Commander
A collaborative technical team is solving the complex hydrogeologic and engineering challenges posed by the fuel leak with support from Albuquerque’s neighborhood groups.
Project Progress

Diane Agnew
New Mexico Environment Department (NMED)
Hydrologist
2017
RFI
RA
Core Sampling and Results
GWM Well Drilling
Site Soil and Groundwater Monitoring Program

2018
RFI Addendum

2019

Interim Cleanup Measures
Vadose Zone: Bioventing Pilot Test
LNAPL: Air-Lift Bioremediation Pilot Test
LNAPL: EDB In-Situ Biodegradation Pilot Test
Groundwater: EDB Plume Collapse (Groundwater Treatment System)
Permitting
Public Meetings, Field Trips, and Outreach

2020
Corrective Measures Evaluation
RA Update*

2021

* Risk numbers may be re-evaluated during CME if necessary
NMED Final 2017 Strategic Plan was posted at end of 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
2017 Strategic Plan – How did we do?

**Strategy #1:** Implement a robust site monitoring and wellhead protection program

- **2017 groundwater data gaps**
  - Installed and sampled two data gap groundwater monitoring well nests
  - No EDB detected to date

- **Quarterly testing of sentinel wells shows no detections of EDB**

- **Monthly testing of drinking water supply wells shows no actionable detections of any fuel constituents**
Site Monitoring & Wellhead Protection

Data Gap Wells
KAFB-106235 and KAFB-106236
No Detection Since 2016 Installation
Rising Water Levels

- Rapid rise in water table observed in Q2 2017
- Reduction in number of monitoring wells screened at the water table
- Technical working groups to scope additional wells

KAFB-106041 added to groundwater monitoring program

Legend:
- Drinking Water Supply Well
- USGS/WUA Sentinel Wells
- Shallow Groundwater Monitoring Well (submerged)
- Shallow Groundwater Monitoring Well (not submerged)
- Q2 2017 EDB Plume Footprint
- KAFB Base Boundary
**2017 Strategic Plan – How did we do?**

**Strategy #2:** Deploy multiple cleanup strategies, both simultaneously and sequentially, to cleanup soil and groundwater

- Began EDB In-Situ Bioremediation Pilot Test interim measure
  - Phase 1 to be completed December 2017 with Phase 2 to follow

- Work plan for vadose zone continuous coring submitted
  - September 2017 technical working group confirmed locations and coring depths
2017 Strategic Plan – How did we do?

**Strategy #2:** Deploy multiple cleanup strategies, both simultaneously and sequentially, to cleanup soil and groundwater

- Continued operation of EDB interim measure
  - Extraction well 228 has been operating for 25 of 29 months (operation began July 2015)
  - Extraction well 233 has been operating for 9 of 22 months (operation began February 2016)
  - Extraction well 234 has been operating for 20 of 22 months (operation began February 2016)
- Installation of 4th extraction well, 239, completed January 2017
- Began construction of conveyance line from 239 to Groundwater Treatment System (GWTS)
- Began construction of pre-treatment at GWTS
- Issuance of final discharge permit (DP 1839) for gravity-fed injection at KAFB-7
- Treated groundwater contains no detectable fuel contaminants and meets drinking water standards
Groundwater Interim Measure

- 4 Groundwater extraction wells complete
- Conveyance line from 106239 – in process
- Gravity-fed injection at KAFB-7 for treated water from GWTS – Discharge Permit 1839
- Gravity-fed injection at KAFB-7 for treated water from GWTS – Discharge Permit 1839
- Golf Course irrigation with treated water from GWTS
2017 Strategic Plan – How did we do?

**Strategy #3:** Meet or exceed all requirements for providing public comment, information, and involvement

- NMED and Air Force have exceeded all regulatory requirements for providing public comment, information, and involvement
- By the end of November, a total of 19 presentations or outreach events in 2017 and 65 GWTS tours will have been conducted
## 2017 Public Outreach To-Date

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>January 10, 2017</td>
<td><strong>Water Quality Control Commission:</strong> Provided project update</td>
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<tr>
<td>March 9, 2017</td>
<td><strong>Regular Public Meeting with Technical Poster Session</strong></td>
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<tr>
<td>March 10, 2017</td>
<td><strong>Water Protection Advisory Board:</strong> Provided project update</td>
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<td>March 11, 2017</td>
<td><strong>Public Technical Workshop</strong></td>
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<td>March 22, 2017</td>
<td><strong>Water Utility Authority Governing Board:</strong> Provided project update</td>
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<td>July 19, 2017</td>
<td><strong>Kiwanis Club:</strong> Provided project update</td>
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<tr>
<td>August 9, 2017</td>
<td><strong>District 6 Neighborhood Coalition:</strong> Provided project update</td>
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<td>September 25, 2017</td>
<td><strong>UNM Water and Energy in NM Guest Lecture:</strong> Presented to graduate and undergraduate students on the project</td>
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<td>September 28, 2017</td>
<td><strong>Public Meeting and Poster Session</strong></td>
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<td>September 30, 2017</td>
<td><strong>Albuquerque International District Fair:</strong> Provided project information</td>
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<tr>
<td>November 3, 2017</td>
<td><strong>New Mexico Radioactive and Hazardous Materials Committee:</strong> Provided project update</td>
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<tr>
<td>November 9, 2017</td>
<td><strong>AWWA/WEA Luncheon; Siesta Hills Neighborhood Assoc.:</strong> Provided project update</td>
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Site Characterization – More to be done!

**Vadose Zone and LNAPL:**
- Interim measures removed light non-aqueous phase liquid (LNAPL) and impacted soil
- Understand how the historic rise and fall of water table affected LNAPL
- Need to estimate mass of LNAPL remaining in vadose zone and submerged sub-surface

**Groundwater**
- Rapid rise in water table observed in Q2 2017
- Reduction of water table monitoring network as water table rises
What’s next for the RFI Report?

• RFI Report will be refined and improved including:
  – Revisions to January 2017 RFI report; and
  – Submittal of an RFI Addendum Report with additional data to be collected to close data gaps and update site conceptual site model

• Data collection will be based on a series of work plans currently in production that will be submitted for NMED review and approval

• This approach allows the RFI Report to be dynamic and reflect 2017 site conditions, and current and planned activities
2018 Strategic Plan

NMED Draft 2018 Strategic Plan will be posted by the end of December 2017 for public comment (www.env.nm.gov/kafbfuelplume)

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1. Implement a robust site monitoring & wellhead protection program
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Project Progress

Mr. Brian Renaghan
Air Force Civil Engineer Center
(AFCEC)
Program Manager
THANK YOU NEIGHBORHOODS!

The Air Force, NMED, and all of the collaborating organizations sincerely thank the neighborhoods for putting up with the road blocks and noise associated with drilling and construction activities in your neighborhoods.
Planned Additional Monitoring Wells

- Work plan for new wells to be submitted for NMED review and approval
- Soil core locations to be completed as monitoring wells
- Existing soil vapor monitoring wells to be incorporated into groundwater monitoring network
Groundwater Sampling Optimization

- Optimize monitoring program through a data-driven iterative process
- Change to passive samplers at 75 EDB groundwater monitoring wells north of Ridgecrest
  - Evaluated passive samplers vs low-flow pump performance in Q2 and Q3 2016 at wells both in and outside of the EDB plume
  - Use of passive samplers reduces investigation derived waste (IDW) and disruption to neighborhoods, while maintaining data quality
  - Passive samplers being evaluated in higher concentrated areas (on-base plume)
Pump and Treat Interim Measure

- 3 extraction wells operational – an average rate of 470 gallons per minute (gpm)
- 4th Extraction Well to come online January 2018
- 298 million gallons of groundwater have been treated, with 81 grams of EDB removed as of November 6th

Extraction Well KAFB-106233 Back online May 2016

4th Extraction Well KAFB-106239
Completed January 2017. Conveyance Line to be completed January 2018
Extraction Well KAFB-106233

- Redeveloped in April 2017 to improve operation
- Resumed well operation in May 2017
- 19% improvement in specific capacity of well
- In addition to well redevelopment and rehab, pre-treatment is necessary at the GWTS
Activities completed in 2017:

• Continued system upgrades and maintenance.
• Installed Treatment Train #2 with additional 400 gpm treatment capacity
• Installed new displays and updated programming for more efficient system operation
• Retrofitted Treatment Train #1 controls, sensors and meters
• Performed maintenance and equipment upgrades at all three extraction wells and KAFB-7
• On-going upgrades to be completed in early 2018 include:
  • Complete sand filter installation
  • Telemetry upgrade and new flow meter at KAFB-7
  • Tie-in of new extraction well KAFB-106239
Groundwater Treatment System (GWTS)
Operation
Road Map for Plume Capture Analysis

- EPA guidance, *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems*, outlines the criteria used to evaluate a capture zone
  - Review site data, CSM, remedy objectives
  - Define target capture zone(s)
  - Water level maps and pairs
  - Numerical analysis and particle tracking
  - Concentration trends
  - Interpret actual capture and compare with target capture zone(s)

*EPA 600/R-08/003, January 2008*
Plume Capture Analysis for BFF

- The EPA process is performed semi-annually to incorporate field data and continue to evaluate the capture zone.
- Distal, or northern, end of plume boundary is delineated with unsubmerged wells - no data gaps in this area.
- The Air Force is working with NMED and other members of the technical working group to address data gaps from submerged well screens and to include additional lines of evidence in the ongoing evaluation of the plume capture.
Pump and Treat Take-Away

• Bring 4th groundwater extraction well online (January 2018)
• Complete installation of pre-treatment sand filters (January 2018)
• Continued discharge of treated groundwater to KAFB-7 and Golf Course
• Refinement of plume capture evaluation through tracking multiple lines of evidence which will provide feedback to GWTS operations
Multi-phase data driven pilot test. Field activities began in January 2017 with installation of wells and system.

Collected baseline samples in July and Sept 2017.

Began Phase 1 in October 2017 - GW extracted and injected for 30 days with tracer to evaluate transport times throughout the pilot test area.

Phase 2, nutrient addition, anticipated to begin in December 2017.
Soil Cores to Evaluate LNAPL

- 8 soil cores to be drilled in 2018 to determine extent of remaining LNAPL in the source area
- 1 background location
- 3 optional locations that may be drilled pending results of other cores
- 6 drilled boreholes will be completed as groundwater monitoring wells and 2 boreholes will be for soil vapor monitoring
Soil Cores to Evaluate LNAPL

- Core samples serve two purposes:
  - Fill RFI data gap for extent of LNAPL
  - Field/laboratory analyses of core samples will characterize LNAPL physical/chemical properties for remedial alternatives in CME

- 100 to 510 feet of core collected per boring

- Extensive field and laboratory analysis to identify LNAPL properties and components such as EDB and other fuel-related compounds, describe geology, and evaluate presence of bacteria that could degrade LNAPL

- Cores will be logged, photographed, and stored at KAFB
What to expect in 2018?

• Continue monitoring soil vapor, groundwater, and drinking water supply wells, rising water levels
• Continue GWTS operation
• Obtain continuous cores from source area to address LNAPL data gaps
• Drill new data gap wells, and incorporate existing monitoring points into monitoring program to account for rising water levels
• Operate EDB in situ biodegradation pilot test
• Implement bioventing and air lift pilot tests to target residual fuel hot spots
• Continued public outreach at public meetings, and with neighborhood associations and various community groups
Questions and Answers

• One question/comment per turn at the microphone

• We request that each question/comment be limited so that everyone has an opportunity to be heard

• Comment cards have been made available:
  – Return completed comment cards to NMED and/or Air Force staff
  – Questions will be incorporated into the Kirtland AFB BFF project website:

  www.kirtlandjetfuelremediation.com
How do I get more information?

Contact NMED:

<table>
<thead>
<tr>
<th>Name</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)

THANK YOU!

Community Outreach

Pilot Test Implementation

GWTS Expansion

Monitoring Program