

# Kirtland Air Force Base Fuel Leak Cleanup



**Project Status Update**  
**July 14, 2016**



# Welcome

**Kathryn Lynnes  
Senior Advisor  
Bulk Fuels Facility Project  
U.S. Air Force**



## **Progress Report by:**

**Adria Bodour, Ph.D., AFCEC Environmental Scientist  
Kathryn Lynnes, Air Force Regulatory Specialist  
Dennis McQuillan, NMED Chief Scientist**

# 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



US Army Corps of Engineers



Sundance Consulting Inc.

Elder Homestead Neighborhood Assoc.

Siesta Hills Neighborhood Assoc.



ABQ City Council  
District 6 Coalition of  
Neighborhood Assocs.



AECOM

NEPTUNE AND COMPANY



Christ United Methodist Church

HAWLEY GEOMATTERS

Thomson and Associates

# 2016 Strategic Plan & Summary

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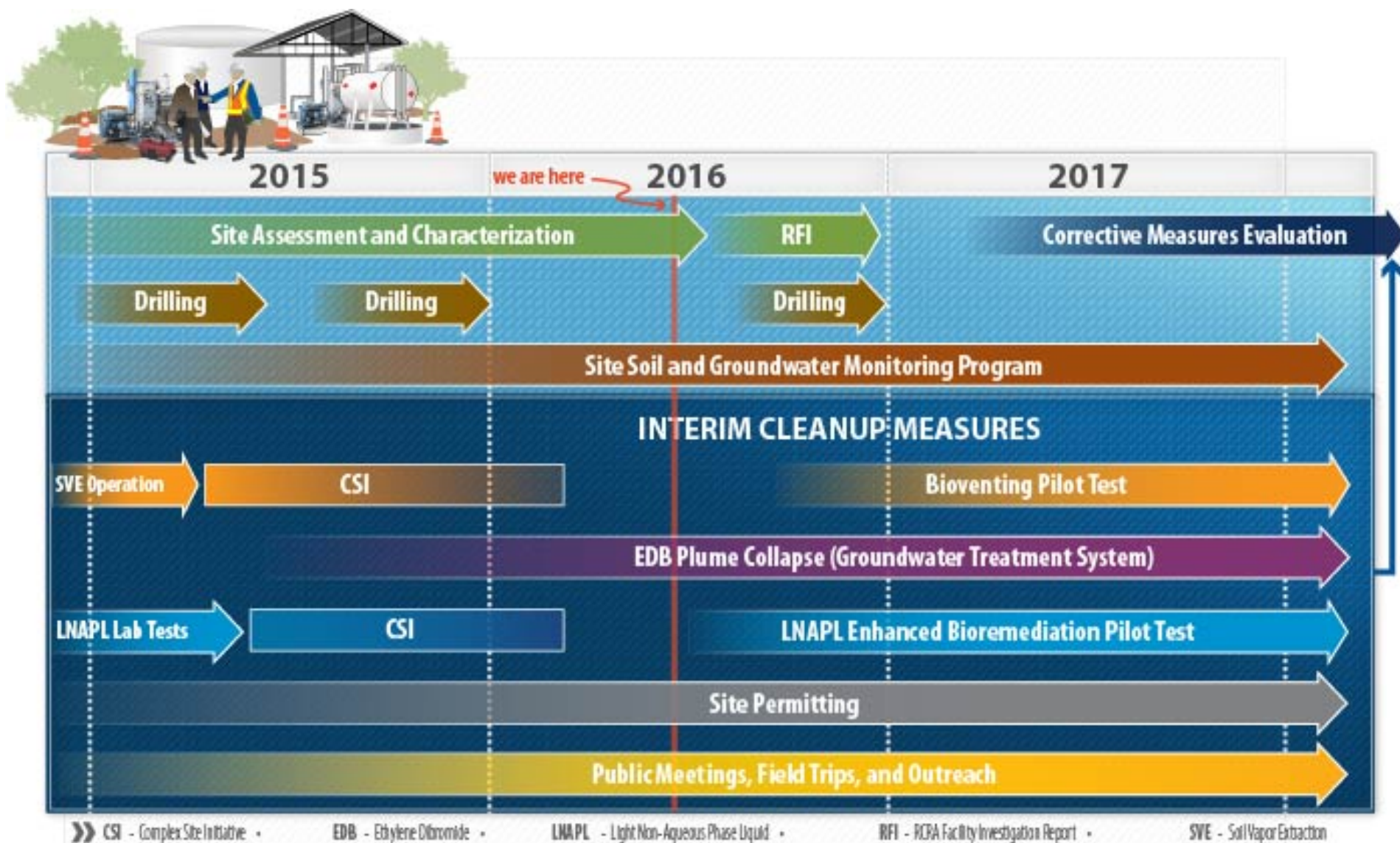
***Goal: Protect Albuquerque's aquifer and drinking water supply wells in the area of the fuel leak***

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

New Mexico Environment Department (NMED) Final 2016 Strategic Plan is available online: <http://www.nmenv.state.nm.us>

# Current RCRA Timeline



# Project Progress Report

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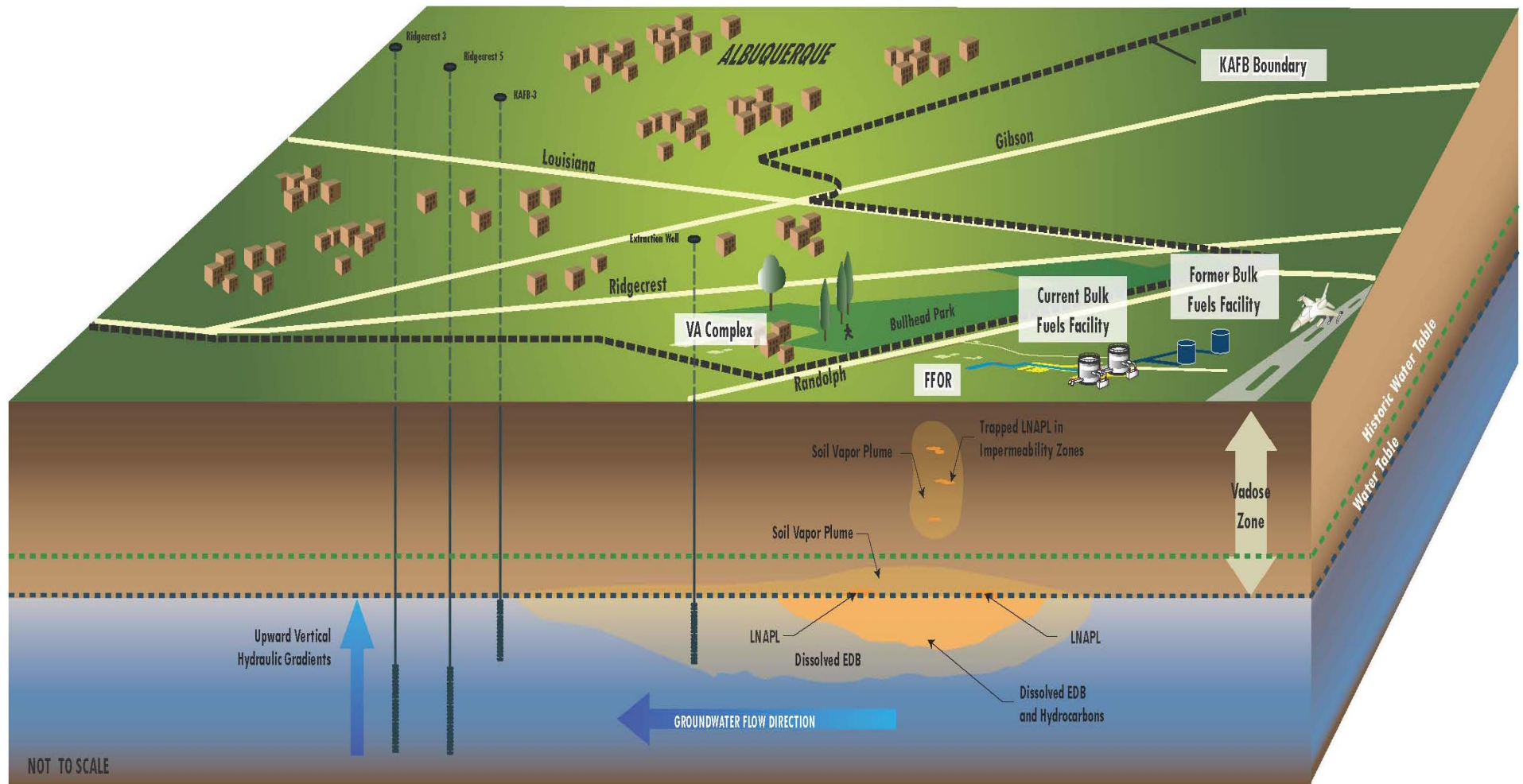
- Continue to have no detections of fuel contaminants in drinking water or sentinel wells
- On-going operation of full-scale groundwater treatment system (GWTS)
- Three extraction wells have created a cone of depression around the “toe” of the EDB plume
- Installed sentinel well cluster on VA Hospital property in May 2016

# Project Progress Report

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- Gravity-fed injection well pilot test at KAFB-7 conducted until April due to change in irrigation needs and maintenance issues; pilot will resume in Fall 2016
- Technical working group met this week to discuss EDB plume collapse data
- In situ respiration and rebound testing data identified areas of residual contamination – sufficient data to develop bioventing interim measure to target hotspots
- RCRA Facility Investigation (RFI) Report in progress for submittal in Winter 2016
- Groundwater and soil vapor monitoring program is on-going

# Conceptual Site Model Based on Current Data



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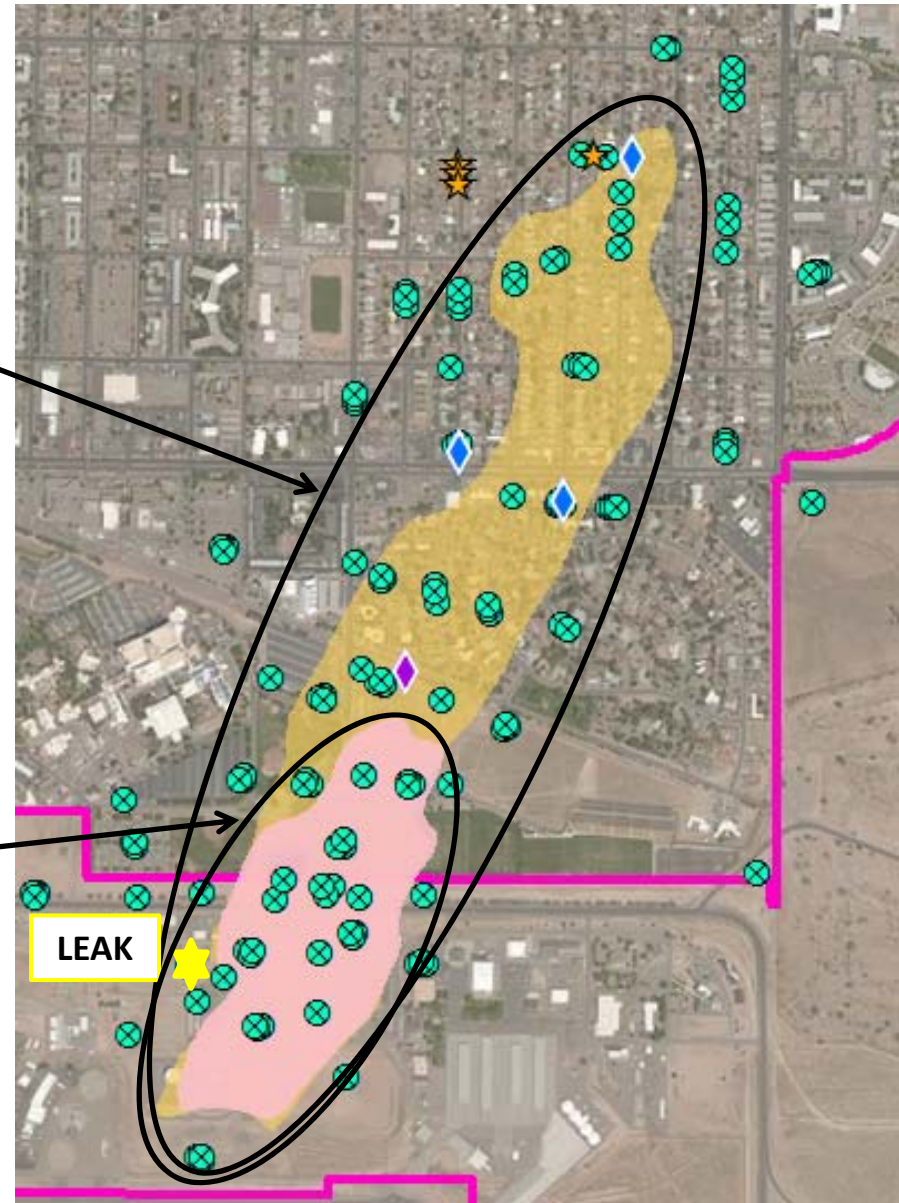
# Anatomy of the Fuel Plume

## EDB Plume

- Downgradient portion shows evidence of hydrolysis (i.e., breaking chemicals down by reacting with water) through new stable isotope data
- Average downgradient concentrations are low, less than 0.1 part per billion (ppb) or micrograms per liter ( $\mu\text{g/L}$ )
- EDB is being anaerobically degraded by natural bacteria in source area

## Source Area

- Residual LNAPL
- Dissolved EDB and hydrocarbons
- Hydrocarbons are being biodegraded by natural bacteria in the groundwater and soil



# Evaluating Potential Risk

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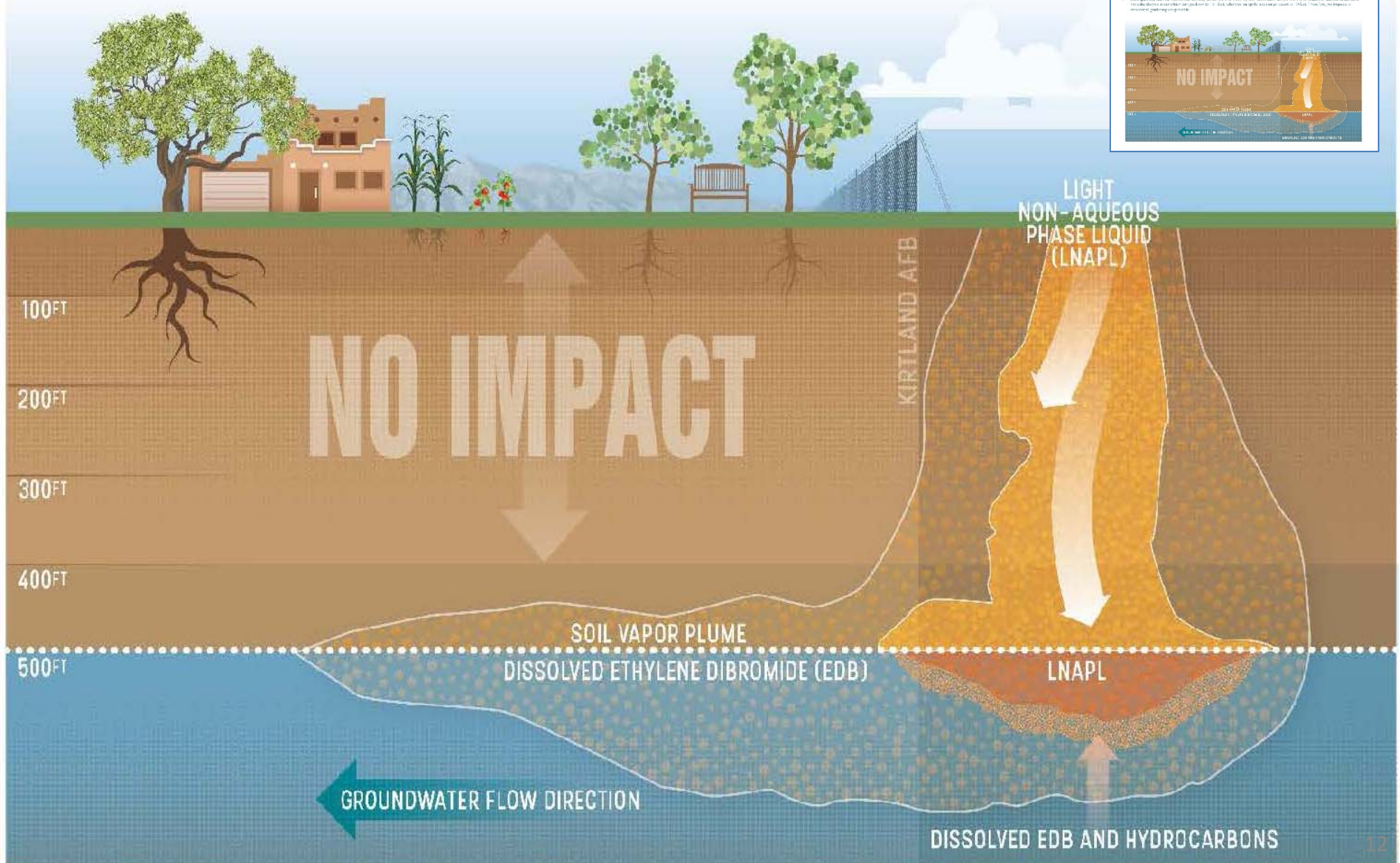
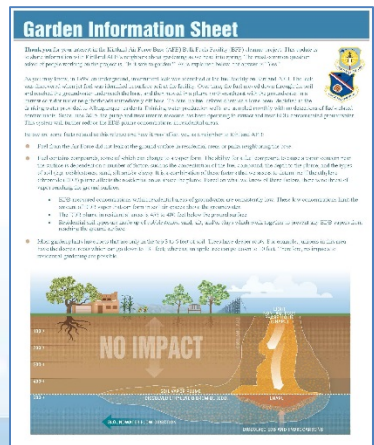
- Current monitoring data and historical records are used to determine human exposure and risk
- Potential risk is identified by evaluating possible contaminant pathways to people and the environment
- A risk assessment evaluates site data against possible pathways
- 2015 update to the [NMED Risk Assessment Guidance](#) provides a conservative road map for the Air Force to evaluate potential risk
- If necessary, risk is re-evaluated as site conditions change
- RFI Report will include the risk assessment and will be submitted in Winter 2016

Potential Exposure Pathway	Risk Level	Explanation
Drinking Water		<p><b>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.</b></p> <p>Public drinking water wells near the groundwater contamination plume are tested monthly, and <u>show no detections of any fuel compounds</u>. Sentinel wells, which are monitoring wells located between the drinking water wells and the contamination plume, are tested quarterly and show no detections.</p>
Surface Soil		<p><b>Surface soil contamination never migrated off of Kirtland.</b></p> <p>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.</p>
Surface Water		<p><b>There is no pathway for contaminants to enter surface water.</b></p>
Vapor Intrusion		<p><b>Homes and businesses are not at risk for vapor contamination.</b></p> <p>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.</p>
Garden Vegetables		<p><b>There is no risk of contamination to garden vegetables.</b></p> <p>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.</p>
Recreational Activities		<p><b>There is no risk of contamination to people enjoying recreational activities in Bullhead Park or in the Dog Park.</b></p> <p>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.</p>

(June 2016)

 <b>Safe</b>	 <b>Use Caution</b>	 <b>Unsafe</b>
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# Garden Information Sheet



# Risk Take-Away

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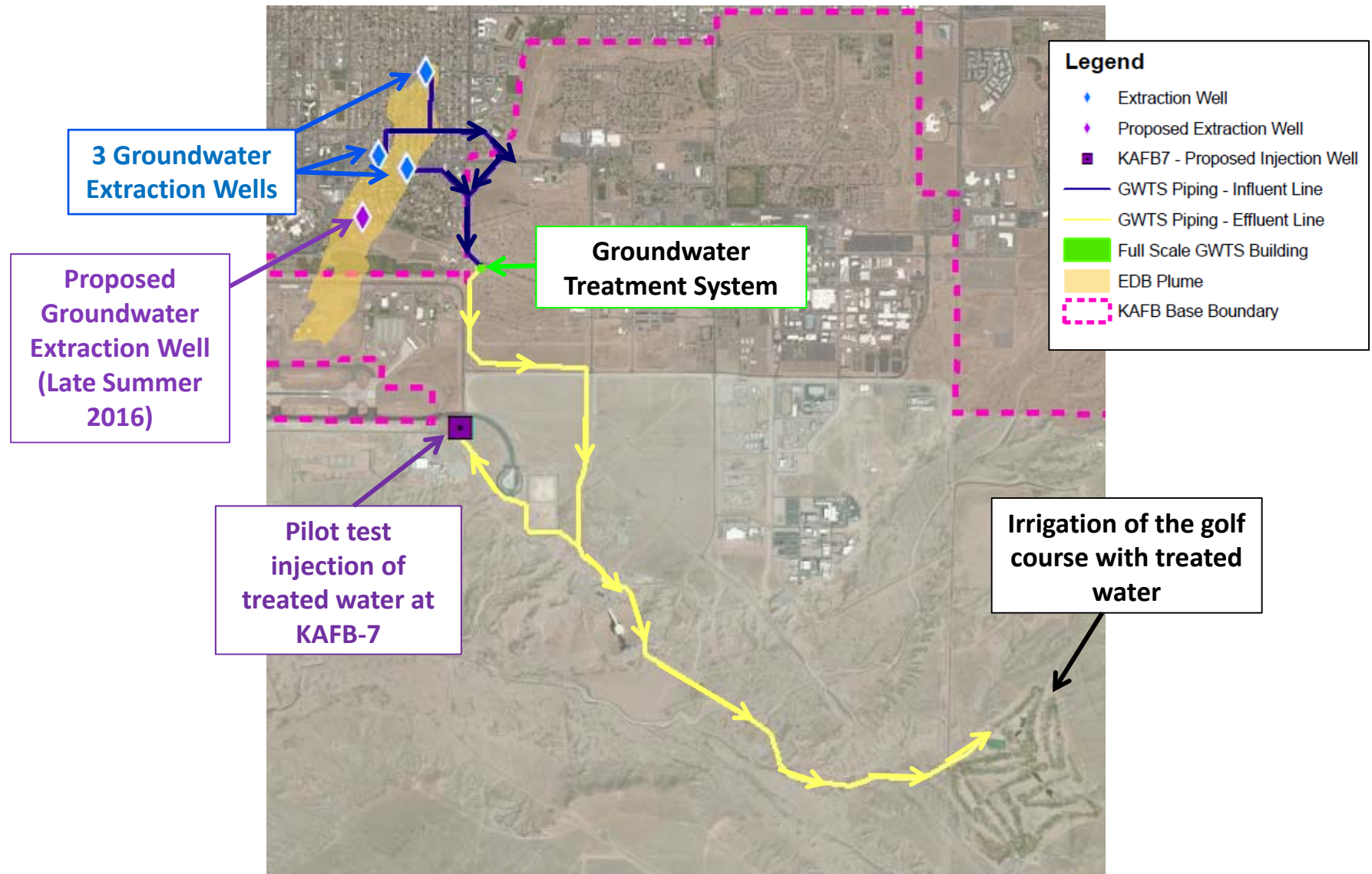
- There is no off-Base surface or near-surface soil contamination
- There is no risk to gardens or people at the ground surface because groundwater contamination is too deep and EDB levels are very low
- Drinking water supply wells are sampled monthly with no detections of fuel-related contaminants to-date

**Contaminant**



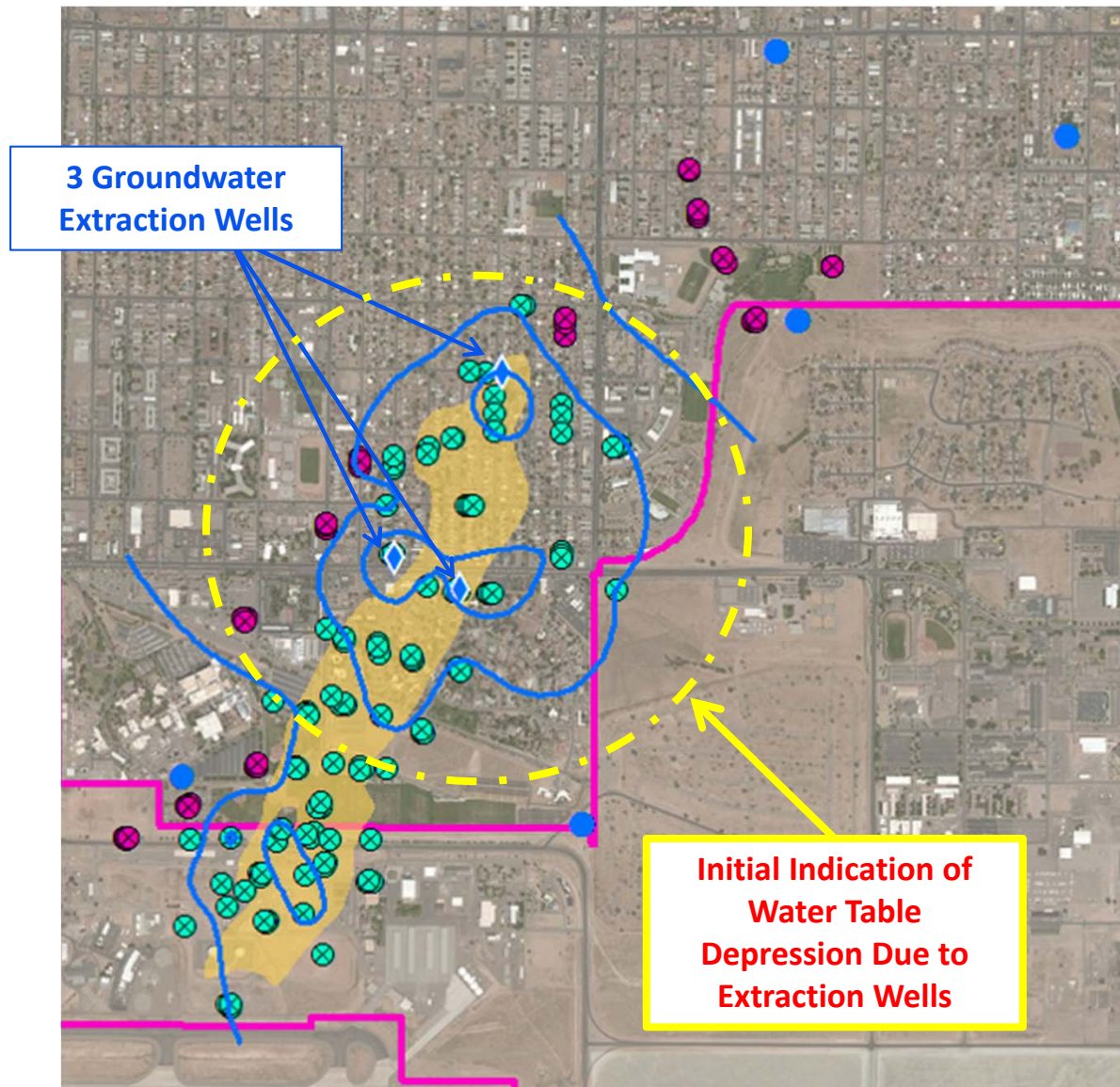
**Human or  
Ecological  
Receptor**

# EDB Plume Collapse



# 2<sup>nd</sup> Quarter 2016 Groundwater Levels

## Evidence of Success

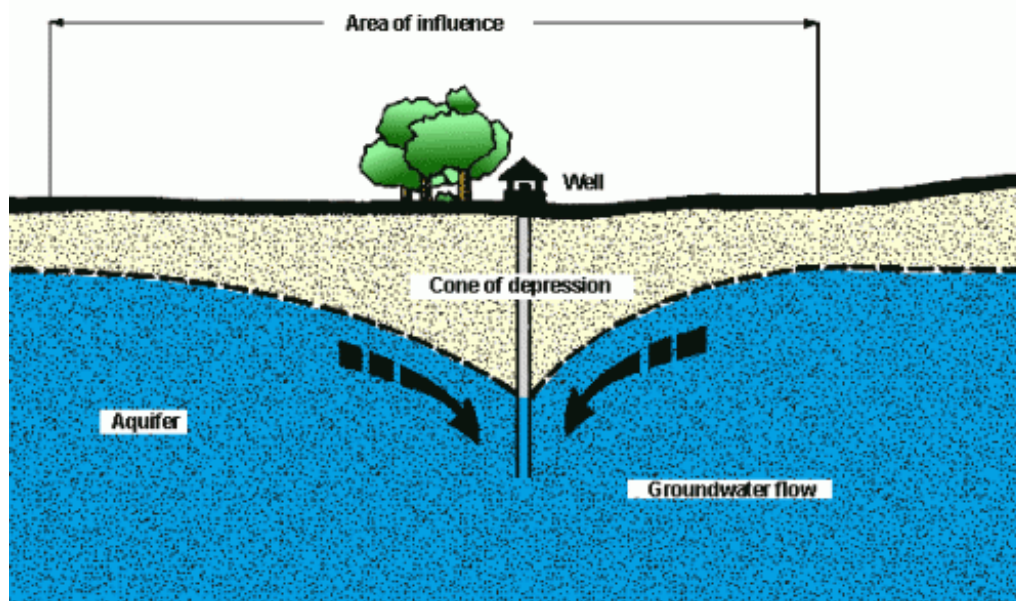


- The “cone of depression” from the first three extraction wells indicates successful removal of EDB-contaminated groundwater
- Plume collapse will be confirmed with EDB concentration trends

### Legend

- ◆ Extraction Well
- ⊗ Groundwater Monitoring Well
- ⊗ Sentinel Well or Well Nest
- Drinking Water Well
- Q2 2016 Shallow GW Contours (04-20-16)
- Q4 2015 EDB Plume
- KAFB Base Boundary

# What is a “Cone of Depression”?



- Forms in the water table when groundwater is extracted in all directions by a pumping well
- Measured water levels in groundwater monitoring wells near the extraction well define the area of influence and capture zone
- One method used to determine if an extraction well is capturing the EDB plume

# GWTS Performance

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- System operation dates: 16 Dec 2015 - present
- System operations are still being fine-tuned (i.e., “shake-down”)
- System Maintenance and Repair Activities:
  - Pump replacement at extraction well KAFB-106228 at Christ United Methodist Church on Gibson
  - Redevelopment of extraction well KAFB-106233 on California, north of Gibson
  - Troubleshoot treatment system fouling
- Two of 3 extraction wells operating at a pumping rate of approximately 300 gallons per minute

# GWTS Performance

Extracted and treated 79 million gallons of EDB-contaminated groundwater and removed 26.8 grams of EDB

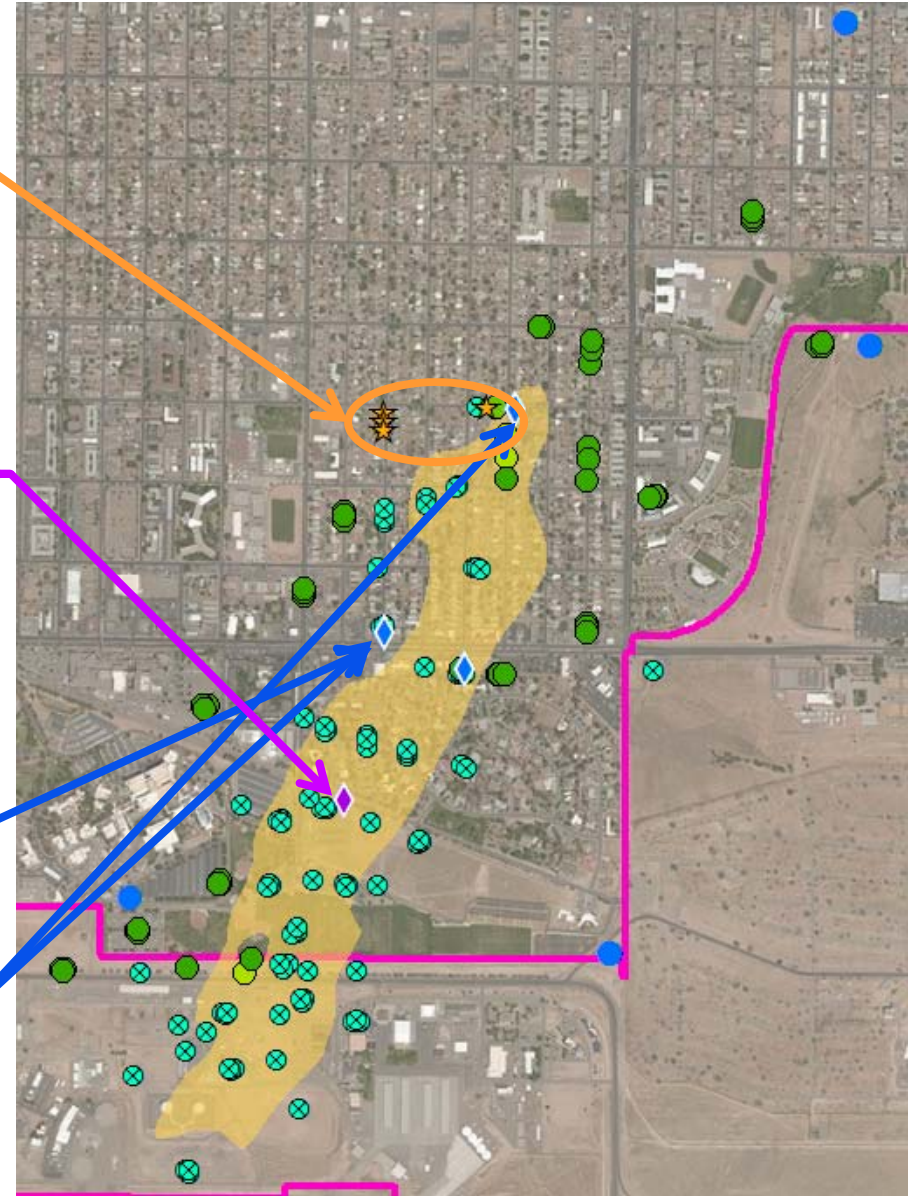
- Average plume concentration is 0.11 parts per billion (ppb) off-Base
- Drinking water standard for EDB is 0.05 ppb

1 Part Per Billion = 1/2 Teaspoon  
in an Olympic Sized Swimming Pool



# What's Next for EDB Plume Collapse?

- Drill and install data gap groundwater monitoring wells in late Summer 2016
- Drill and install 4<sup>th</sup> extraction well south of Ridgecrest in Winter 2016
- Install sand filters to address GWTS fouling
- Redevelop KAFB-106233
- Conduct aquifer testing of extraction wells



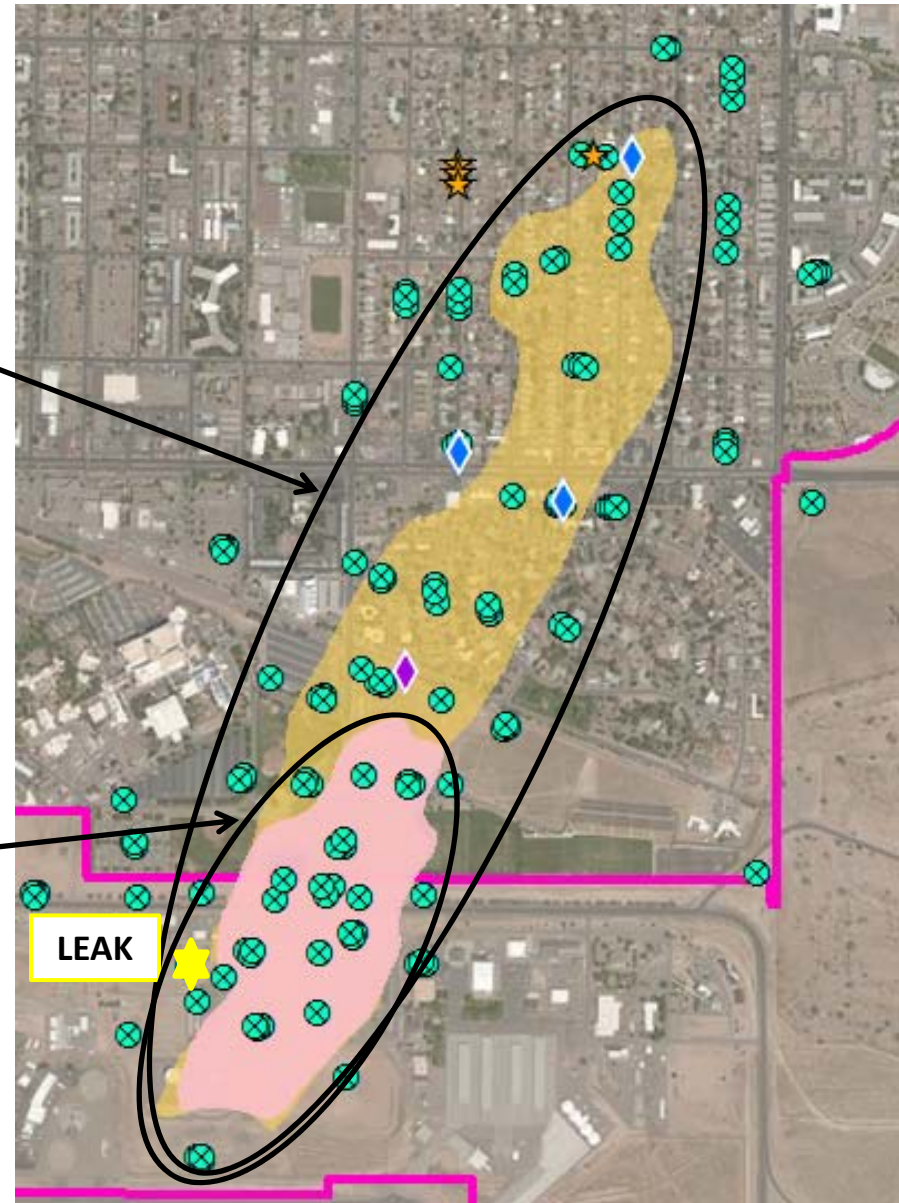
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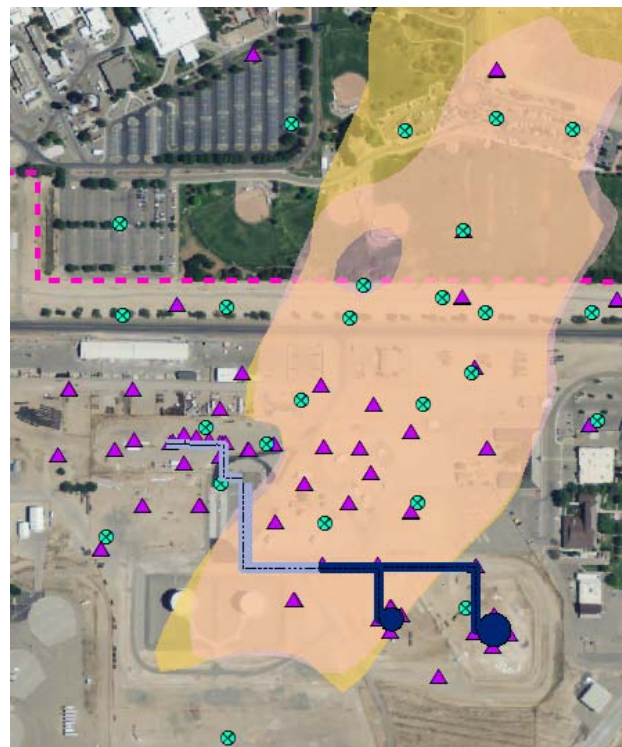
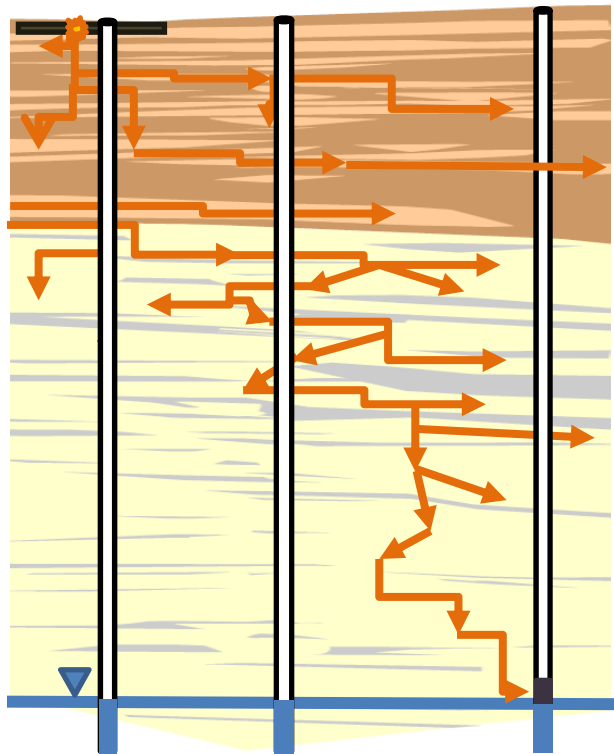
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## Source Area

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# Source Area Cleanup

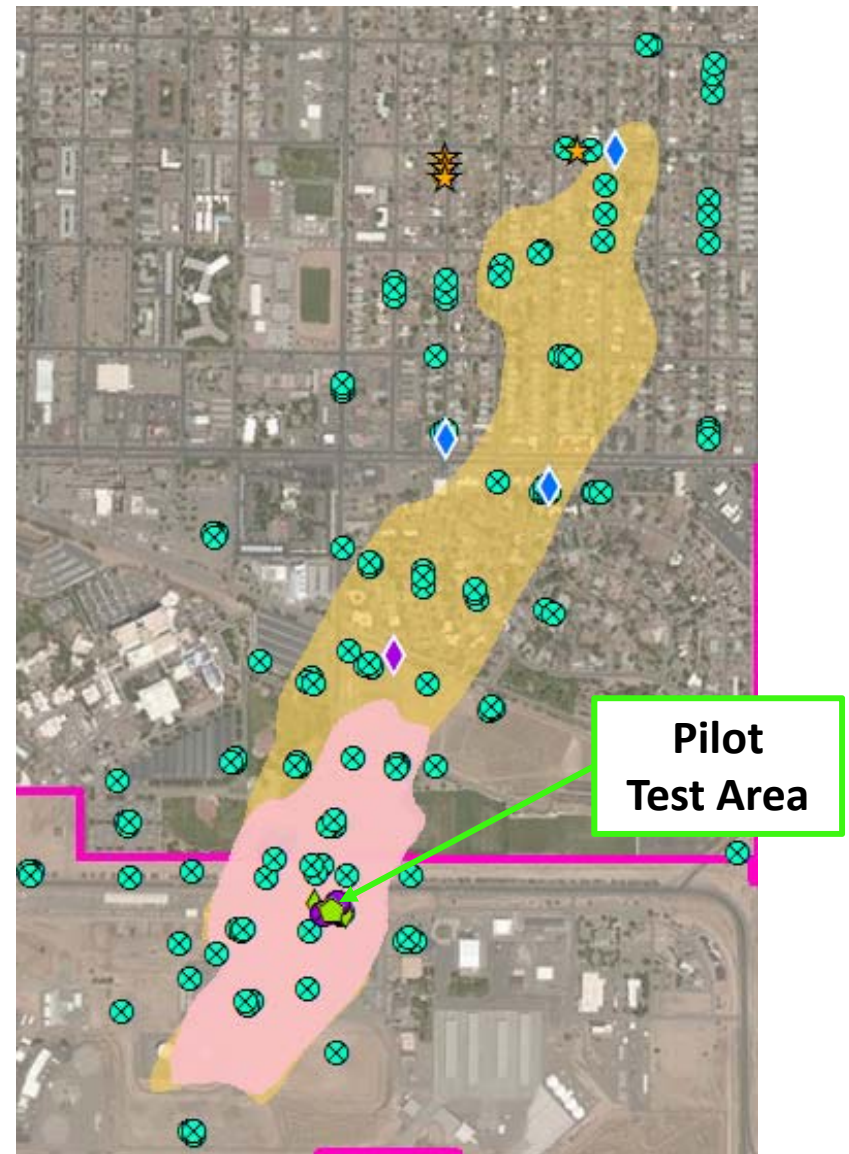


- Vapor and fuel compounds removed by soil vapor extraction (SVE)
- A lot of LNAPL floating on the water table removed by SVE
- Residual LNAPL smeared and is a source of EBD into the groundwater

# In Situ Anaerobic Degradation Pilot Test

**Objective:** To demonstrate in situ EDB biodegradation under anaerobic conditions using a phased amendment approach

- Reflects laboratory microcosm analysis outcomes
- Located near on-base groundwater well with increasing EDB concentrations
- Work plan will be submitted in July 2016 for NMED review and approval
- Planning to begin work in August 2016

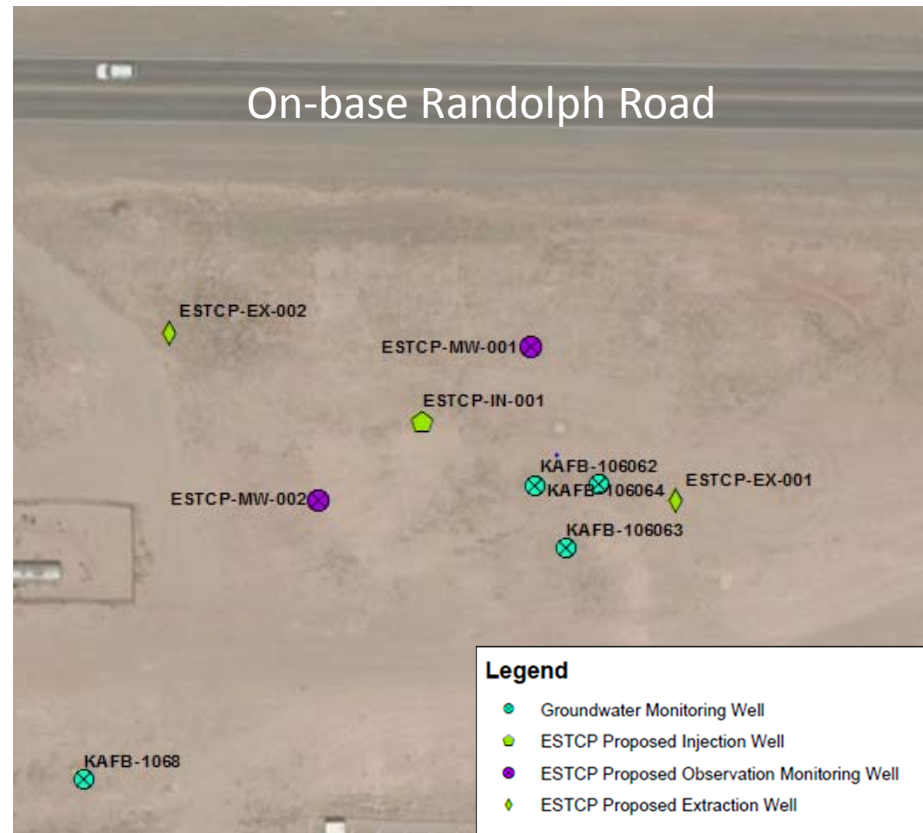


# Pilot Test Infrastructure

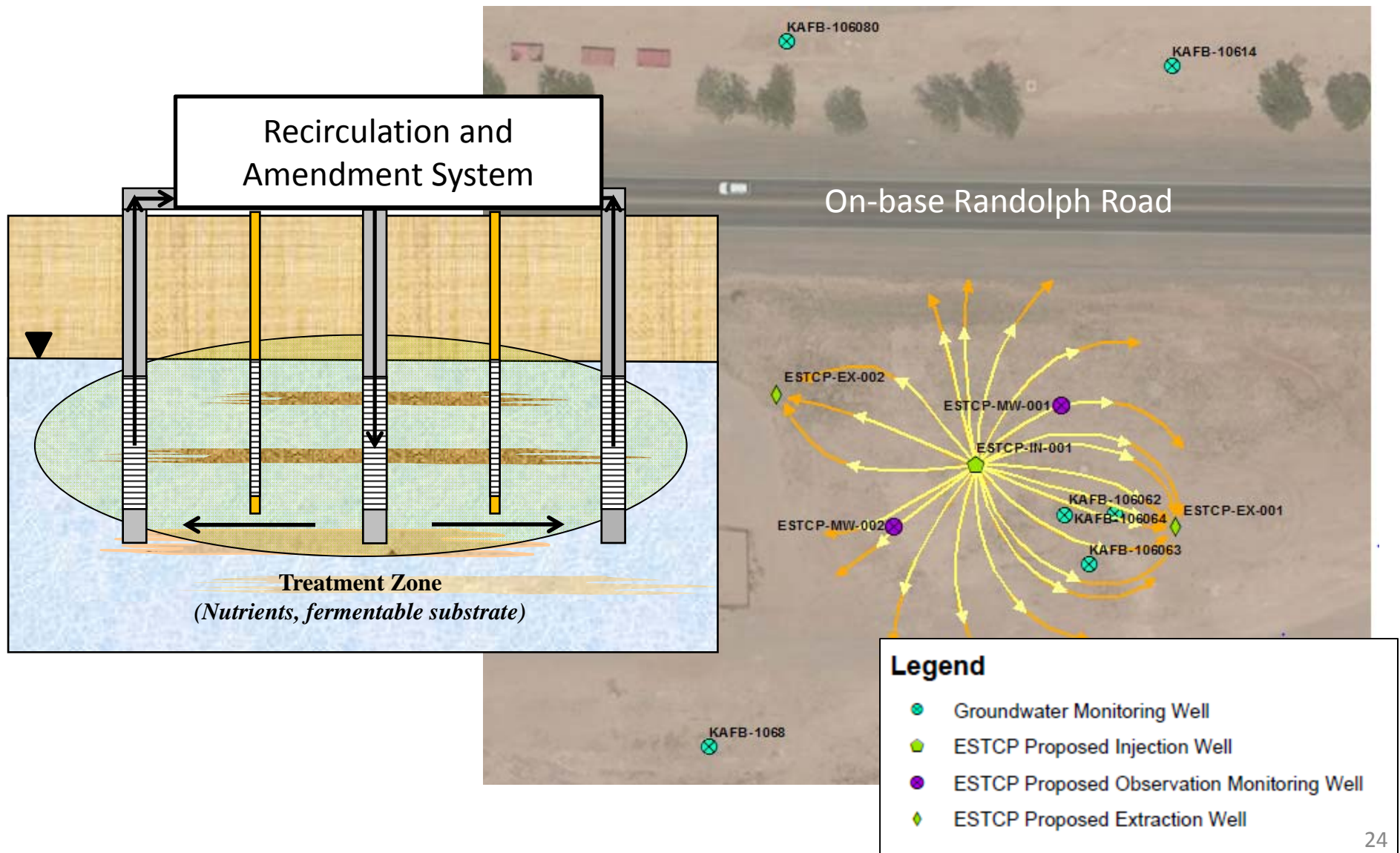
Will use two existing groundwater monitoring wells (i.e., one shallow and one intermediate)

Installing five new wells:

- Two extraction wells
- One injection well with control valve
- Two additional groundwater monitoring wells



# How is the Pilot Test Designed?



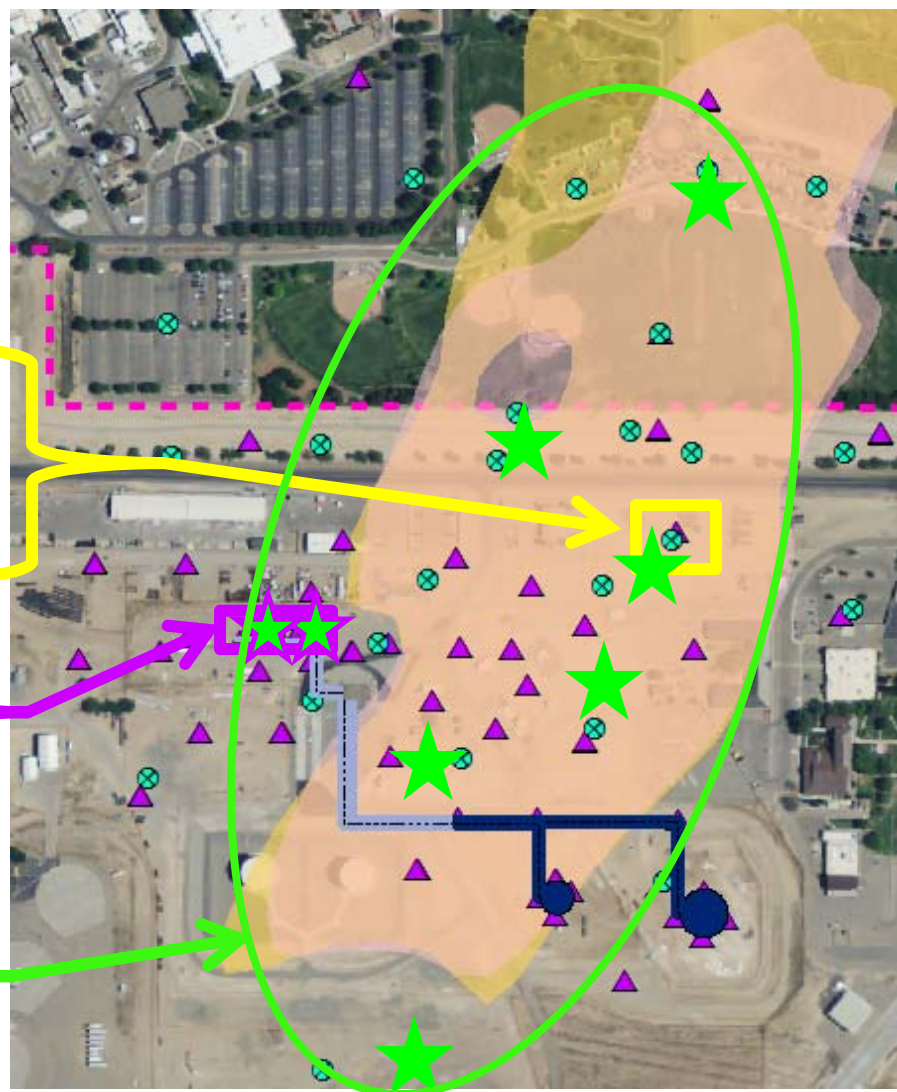
# How will Pilot Test be Implemented?

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- **Phase 1: Baseline Testing**
  - Approximately 1 month of recirculation
  - 2 months of monitoring
- **Phase 2: Biostimulation**
  - Addition of sodium lactate, diammonium phosphate [DAP] and yeast extract (i.e., inorganic nutrients)
  - Approximately 1 month of recirculation
  - 4 months of monitoring
- **Phase 3: Bioaugmentation**
  - Addition of sodium lactate, DAP, yeast extract, and microorganism culture
  - Approximately 1 month of recirculation
  - 2 months of monitoring

# What's Next for the Source Area?

- On-going in situ respiration and rebound data collection and analysis ▲
- Implement in situ biodegradation of EDB pilot test (Fall 2016)
- Bioventing pilot test scoping and work plan (Winter 2016)
- Soil coring in source area scoping and work plan (Winter 2016)



EDB and benzene plumes contoured with 4<sup>th</sup> Quarter 2015 data

# Continuing Progress in 2016

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- Submit In Situ Anaerobic Degradation Pilot Test Work Plan (July 2016)
- Drill and install data gap groundwater monitoring wells (Summer 2016)
- Conduct aquifer testing of 2<sup>nd</sup> and 3<sup>rd</sup> extraction wells (Winter 2016)
- Drill, install, and test 4<sup>th</sup> extraction well, south of Gibson (Winter 2016)
- Expand groundwater treatment system to increase treatment capacity (Winter 2016)

# Continuing Progress in 2016

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- Conduct field-work for In Situ Anaerobic Degradation Pilot Test in on-Base source area (Fall 2016)
- Submit Bioventing Pilot Test Work Plan (Winter 2016)
- Submit Continuous Soil Coring Work Plan (Winter 2016)
- Conduct technical working group meetings to optimize soil vapor sampling program, locate groundwater injection wells, and advance cleanup using current data (Summer/Fall/Winter 2016)

# 2016 Public Outreach To-Date

Date	Description
January 12, 2016	<b>Kirtland Partnership Committee:</b> Provided project update
February 10, 2016	<b>District 6 Neighborhood Coalition Meeting:</b> Provided project update
February 24, 2016	<b>Highland High School Advanced Placement Chemistry and Environmental Science:</b> Worked with chemistry students to design lab experiments and presented results to April public meeting participants
April 8, 2016	<b>New Mexico Geological Society Spring Meeting:</b> Presented on site stratigraphy and migration of the EDB plume at the BFF site
April 13, 2016	<b>New Mexico Tech Engineering Club:</b> Presented undergraduate and graduate engineering students on the BFF site
April 19, 2016	<b>Regular Public Meeting with Poster Session</b>
April 23, 2016	<b>Public Field Trip:</b> Toured groundwater treatment facility and discharge points
May 26, 2016	<b>International District Healthy Communities Coalition Meeting:</b> Provided project information
June 22, 2016	<b>Water Utility Authority Governing Board:</b> Provided project update
July 12, 2016	<b>New Mexico Legislature, Radioactive and Hazardous Materials Committee:</b> Provided project update

# Currently Scheduled Public Outreach

Date	Description	Location
July 14, 2016	<b>Regular Public Meeting with Technical Deep Dive and Poster Session</b> 5:00 – 6:00 p.m. Technical Deep Dive 5:30 – 6:00 p.m. Poster Session 6:00 – 8:30 p.m. Presentation with Q&A	African American Performing Arts Center, 310 San Pedro Dr. NE
Aug 15, 2016	<b>Rotary Club of Albuquerque</b> 12:00 – 1:00 p.m.	Hotel Albuquerque, 800 Rio Grande Blvd. NW
Aug 2016	<b>Listening Session with Elected Officials</b> TBD	Location TBD
Sept 15-16, 2016	<b>New Mexico Water Law Conference</b> TBD	Santa Fe, NM
Sept 24, 2016	<b>Albuquerque International District Fair</b> 10:00 – 5:00 p.m.	Veterans Memorial Park, 1100 Louisiana Blvd SE
Nov 10, 2016	<b>Regular Public Meeting with Poster Session</b> 5:00 – 8:30 p.m.	African American Performing Arts Center, 310 San Pedro Dr. NE
Nov 2016	<b>Public Technical Workshop</b> TBD	Location TBD

# Recap

- Drinking water supply wells continue to show no contamination
- 2<sup>nd</sup> Quarter 2016 groundwater data indicate first major milestone in plume collapse → lowering of water table at extraction well locations, or cone of depression
- On-going extraction and treatment of EDB-contaminated groundwater with a 4<sup>th</sup> extraction well coming soon
- Work plans submittals; begin implementation of two interim measures/pilot tests in source area
- RFI Report submittal Winter 2016



# Questions and Answers

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- 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](http://www.kirtlandjetfuelremediation.com)

# How do I get more information?

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## **Contact NMED:**

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Chief Scientist

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**NMED Website and Listserv:** [www.env.nm.gov](http://www.env.nm.gov)

## **Contact the Air Force:**

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

**Kirtland AFB website:** [www.kirtland.af.mil](http://www.kirtland.af.mil) in the Environmental Issues section for Public Records