



# Kirtland Air Force Base Fuel Spill Cleanup

March 12, 2015



# Welcome

**Col. Tony Haught  
Commander  
U.S. Air Force  
377<sup>th</sup> Mission Support Group**



# Thank You Neighborhoods!

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The Air Force and New Mexico Environment Department (NMED) sincerely thank the neighborhoods for putting up with the temporary road blocks and noise from the well drilling rigs.



# Kirtland Air Force Base Bulk Fuel Facility Site

## Progress Report



**Adria Bodour, Ph.D., AFCEC Environmental Scientist**  
**Dennis McQuillan, NMED Geologist**





# A Partnership for Success

The following organizations are working together to solve the complex hydrogeologic and engineering challenges posed by the fuel spill site.



# RCRA Corrective Action Process

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**Kirtland Air Force Base must comply with their Resource Conservation and Recovery Act (RCRA) Hazardous Waste Permit, including the Corrective Action Process**

Site Assessment & Characterization

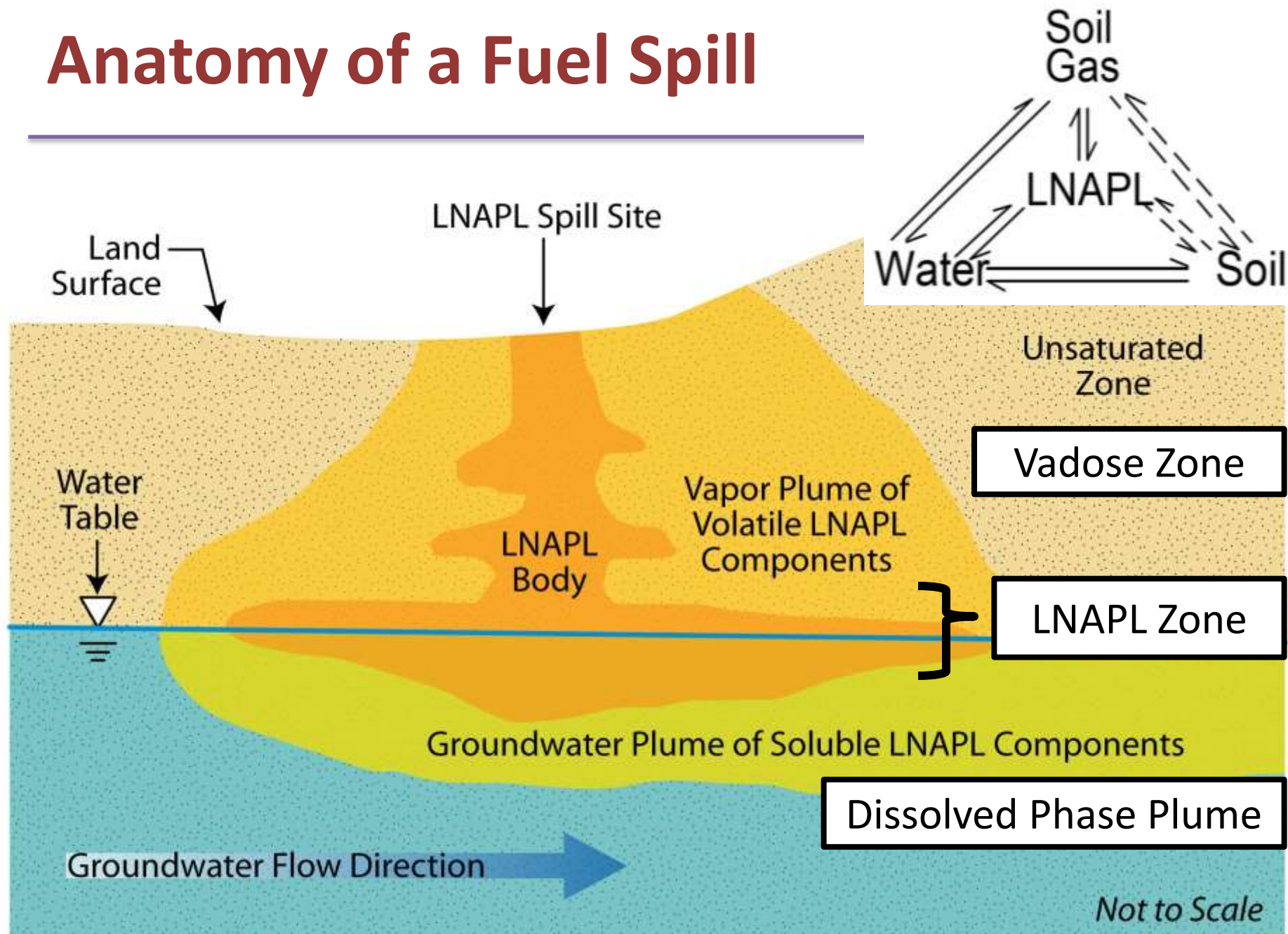
Identify & Evaluate Final Corrective Measures

Public Notice and Participation

Implement Final Corrective Measures

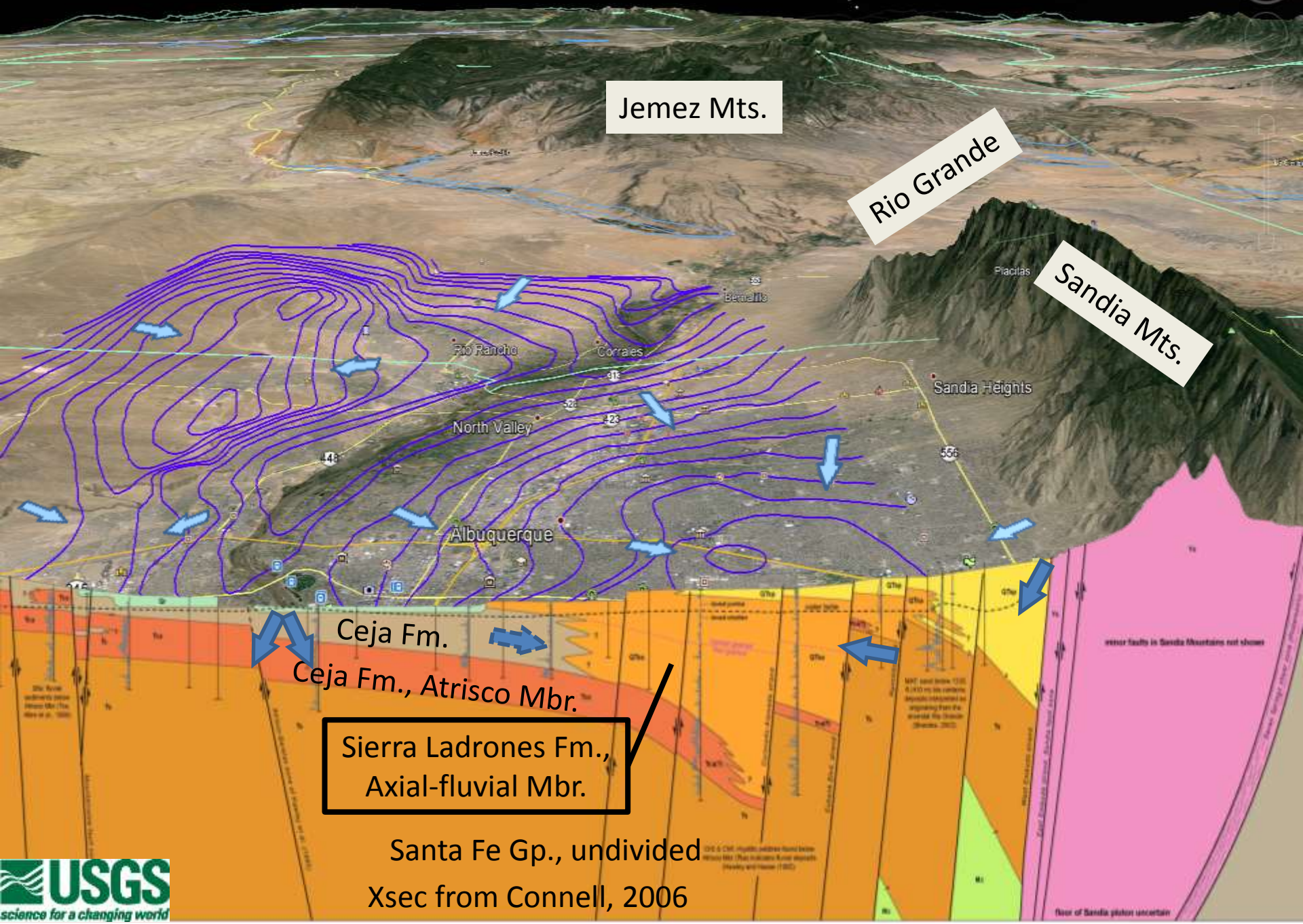
Develop & Implement Interim Measures

# Anatomy of a Fuel Spill





# Conceptual Model of Groundwater Flow



Jemez Mts.

Rio Grande

Sandia Mts.

Ceja Fm.  
Ceja Fm., Atrisco Mbr.  
Sierra Ladrones Fm.,  
Axial-fluvial Mbr.

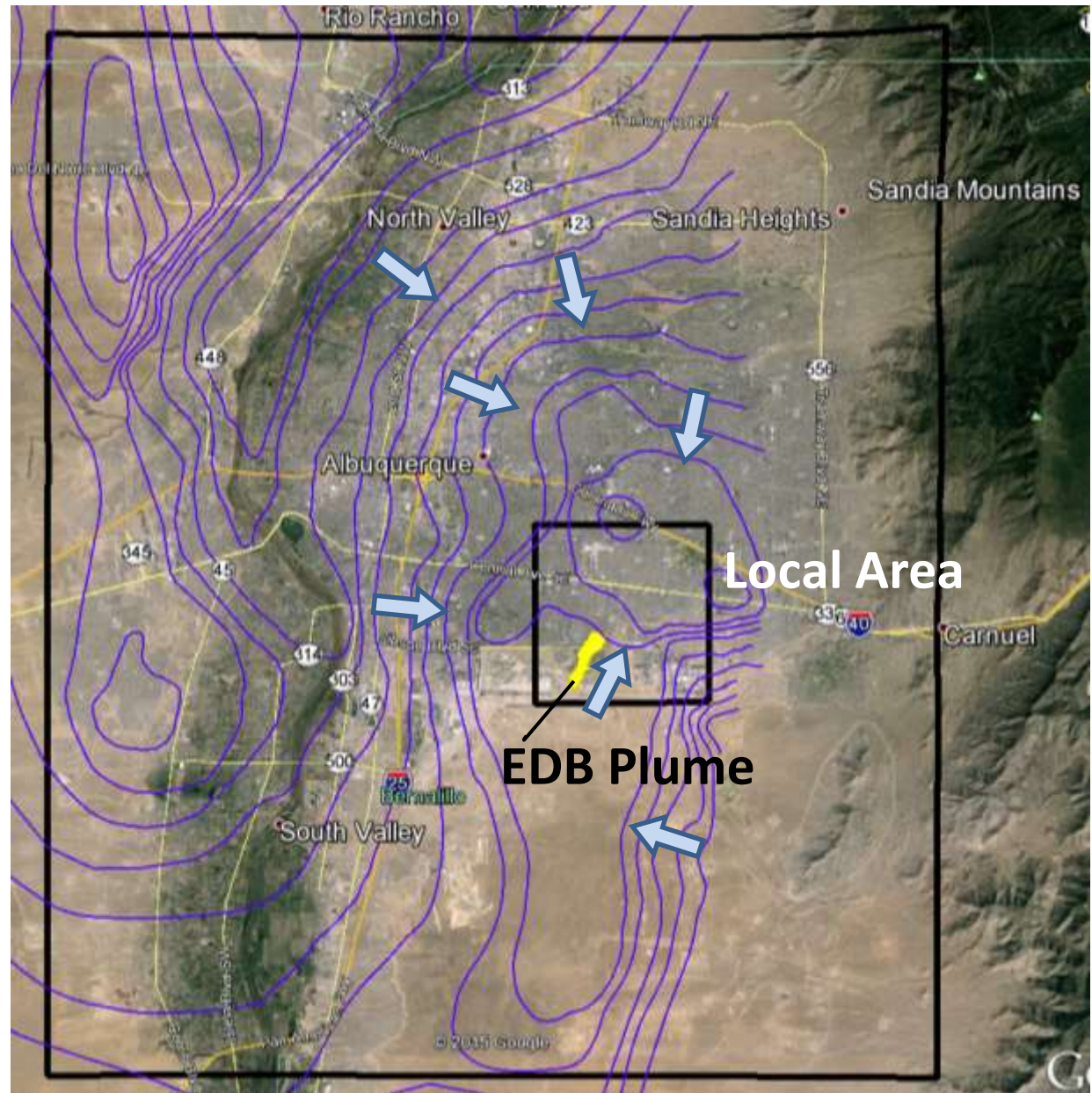
Santa Fe Gp., undivided  
Xsec from Connell, 2006



# Groundwater Flow in the Sub-Regional Metro Area

— 2012 production zone water level contours; 5 and 10 feet contour intervals

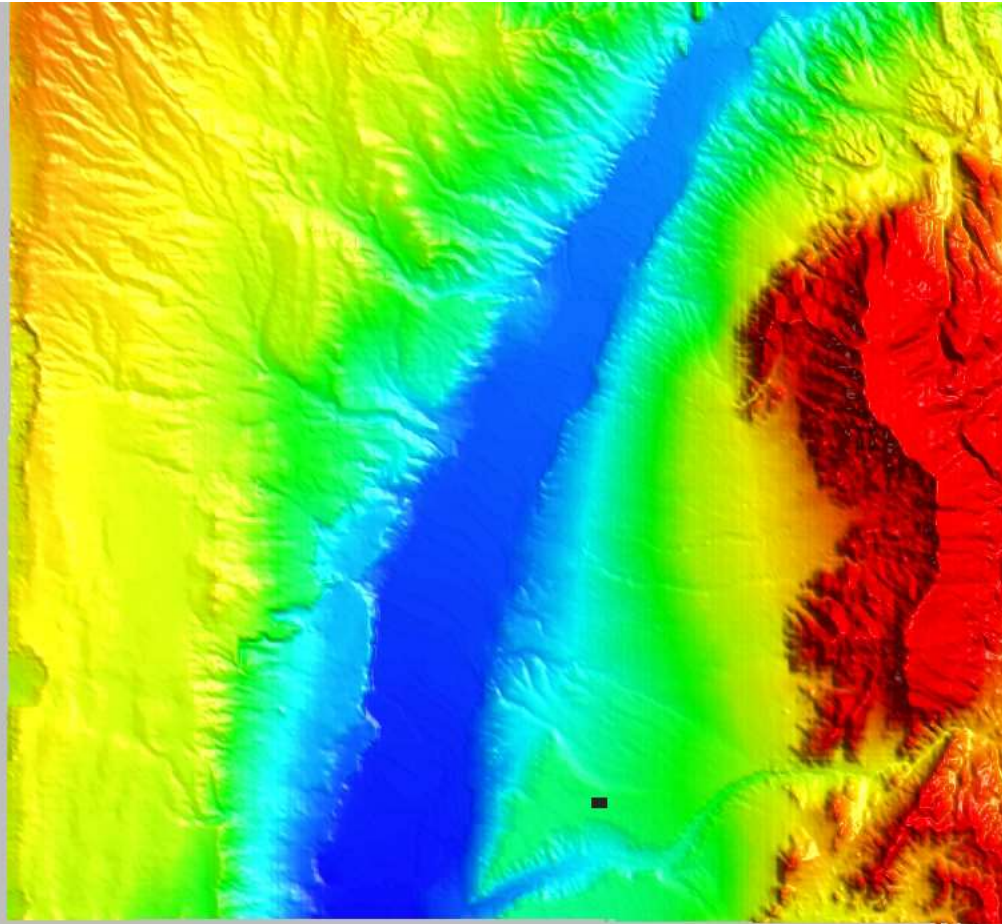
➔ Groundwater Flow Direction



# Site Stratigraphy and Wells



John Sigda, Ph.D., Intera



# Monitoring Update

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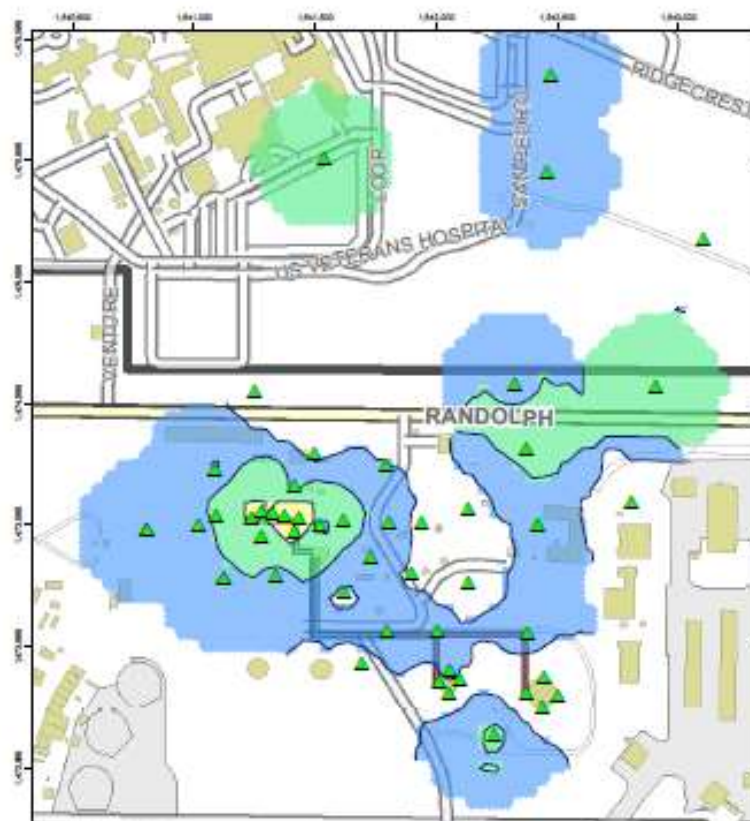
- **Monthly testing of drinking water wells continues to show no evidence of contamination**
- **No contaminant detects in any sentinel wells**
- **Water table continues to rise**
- **Plume geometry is relatively stable**
- **Soil Vapor Extraction (SVE) appears to have had beneficial impact on groundwater contamination**
- **Soil vapor concentrations have decreased substantially**



# Total Volatile Organic Compounds (VOC) Soil Vapor

Q4-2011

Q4-2014



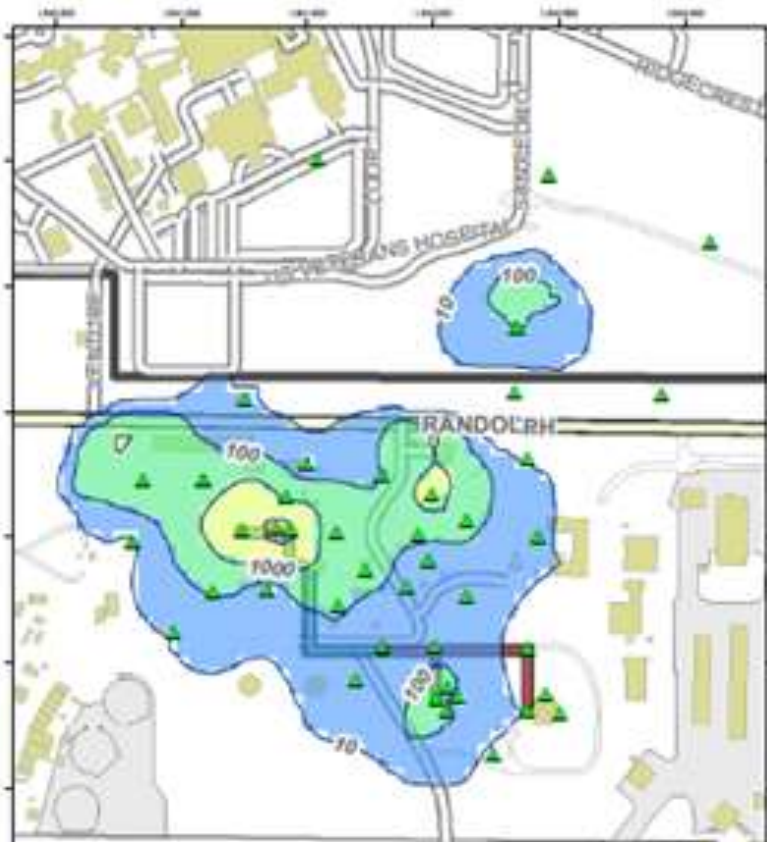
VOC Concentration (ppmv)

- 10 - 100
- 100 - 1000
- 1000 - 10,000
- >10,000

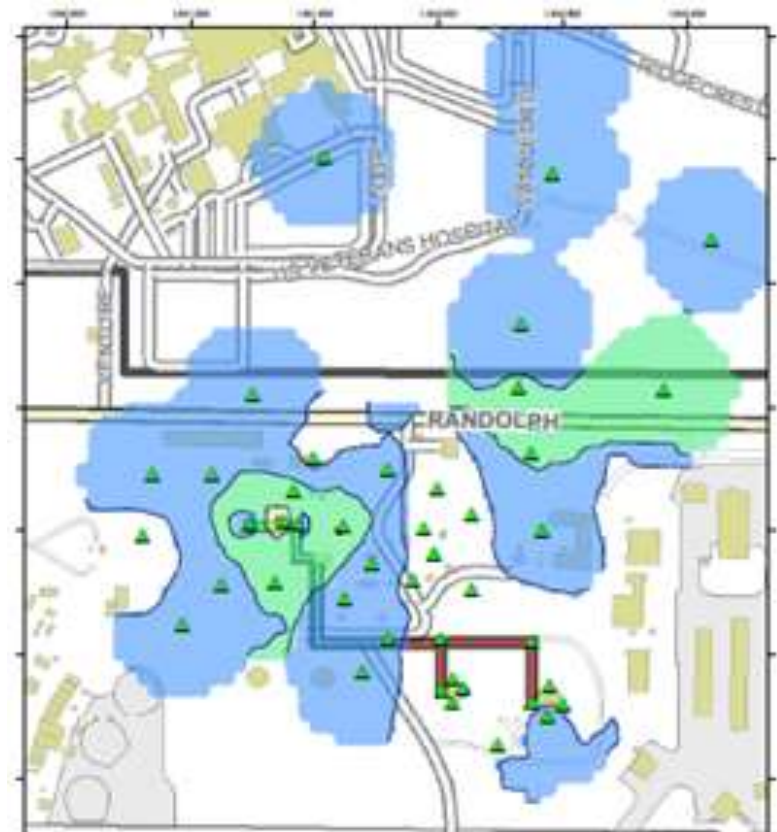
50 feet below ground surface

# Total VOC Soil Vapor

Q4-2011



Q4-2014



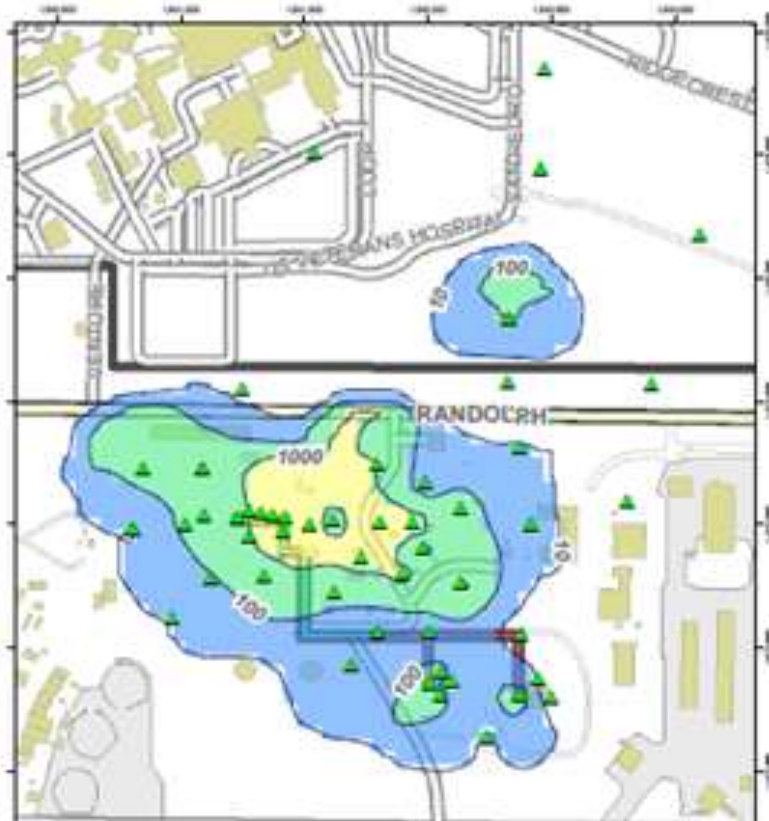
VOC Concentration (ppmv)

Blue	10 - 100
Green	100 - 1000
Yellow	1000 - 10,000
Orange	>10,000

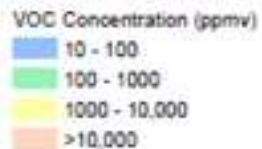
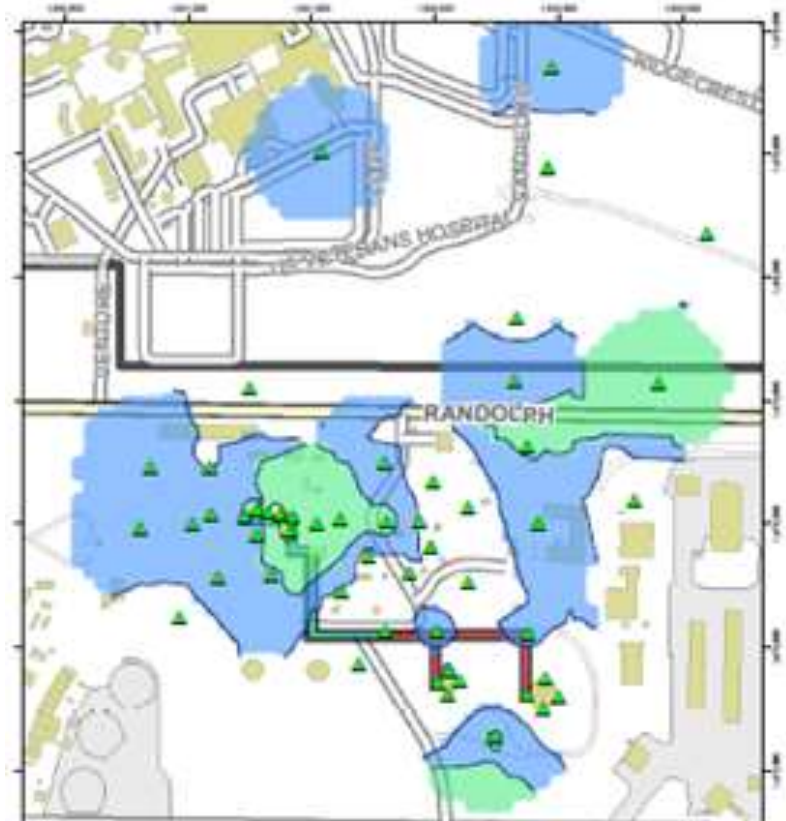
150 feet below ground surface

# Total VOC Soil Vapor

Q4-2011



Q4-2014



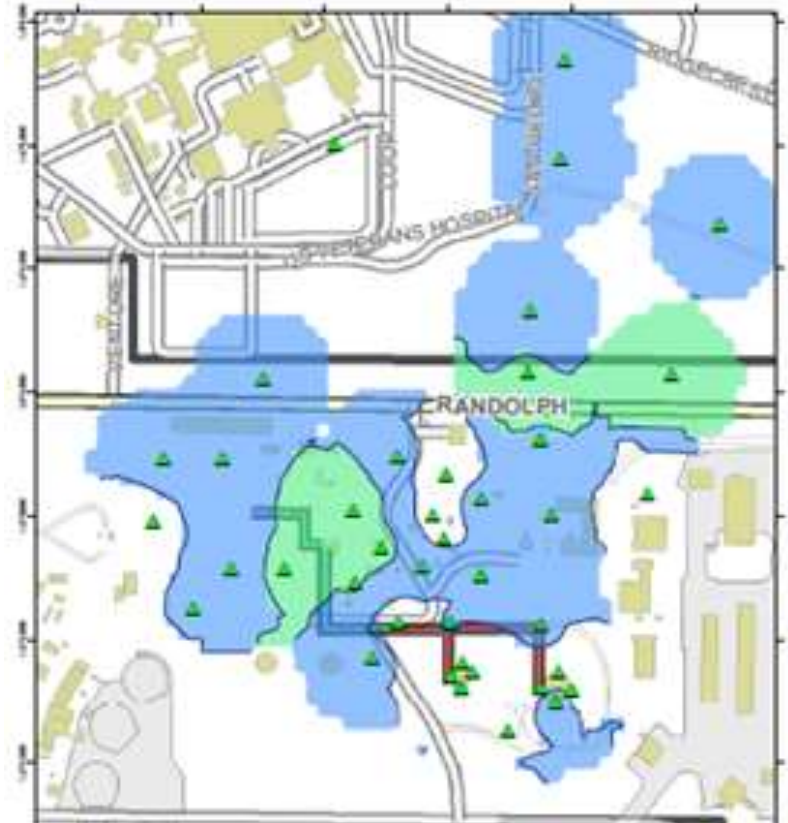
250 feet below ground surface



# Total VOC Soil Vapor

Q4-2011

Q4-2014



VOC Concentration (ppmv)

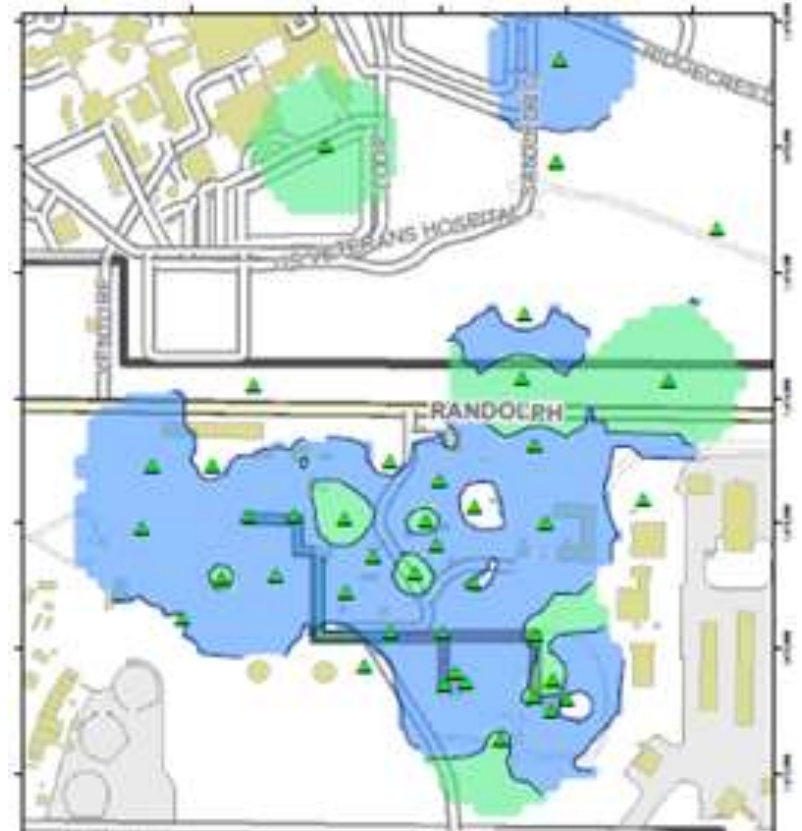
Blue	10 - 100
Green	100 - 1000
Yellow	1000 - 10,000
Orange	>10,000

350 feet below ground surface

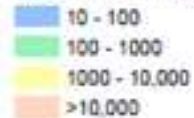
# Total VOC Soil Vapor

Q4-2011

Q4-2014



VOC Concentration (ppmv)



450 feet below ground surface

# Soil Vapor Takeaway

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- **After 12 years of SVE operation, more than 500,000 gallons of contaminants have been removed and soil vapor concentrations have dramatically decreased**
- **Now is the opportune time to do rebound testing to identify remaining hot spots**
- **Now is also the time to do a biorespiration test to understand the contaminant degradation occurring in the vadose zone**
- **Now that vapors are knocked down, we are going to attack hot spots using SVE**



# Benzene Plume Stability

Q4-2011



Q4-2012



Q4-2013



Q4-2014




Benzene Concentration (ug/L)

5 - 10

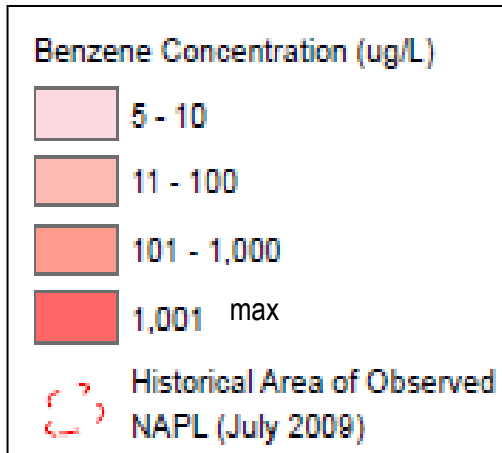
11 - 100

101 - 1,000

1,001 max

 Historical Area of Observed NAPL (July 2009)

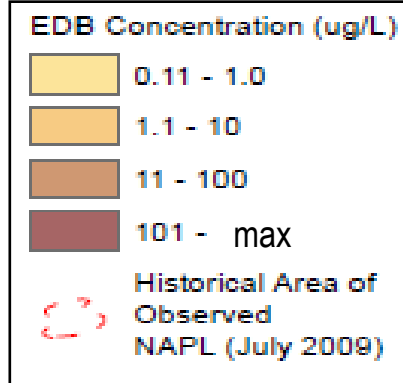
# Benzene and Vacuum at 450 Feet



Observed Vacuum (inches of water)



# Ethylene Dibromide (EDB) Plume Stability





# EDB Plume and Vacuum at 450 Feet



## EDB Concentration (ug/L)

0.11 - 1.0

1.1 - 10

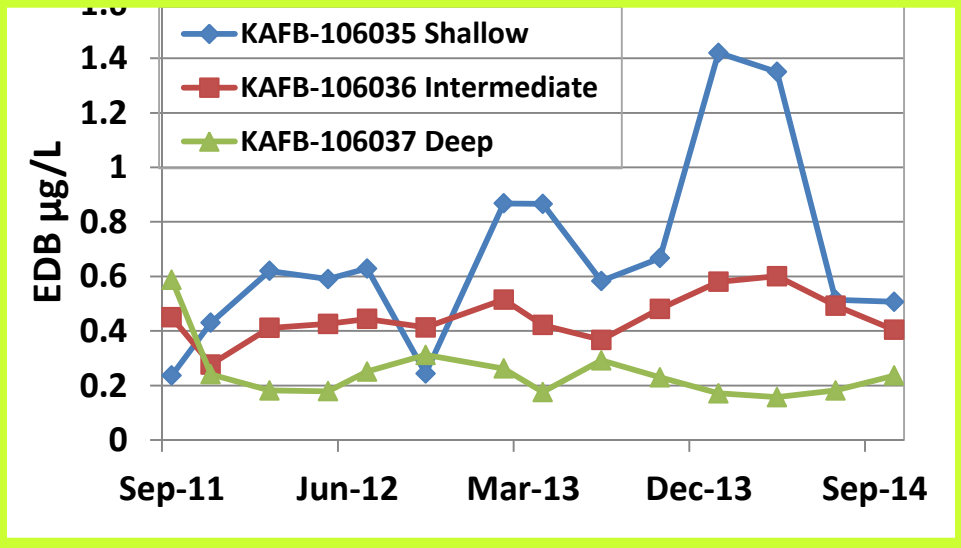
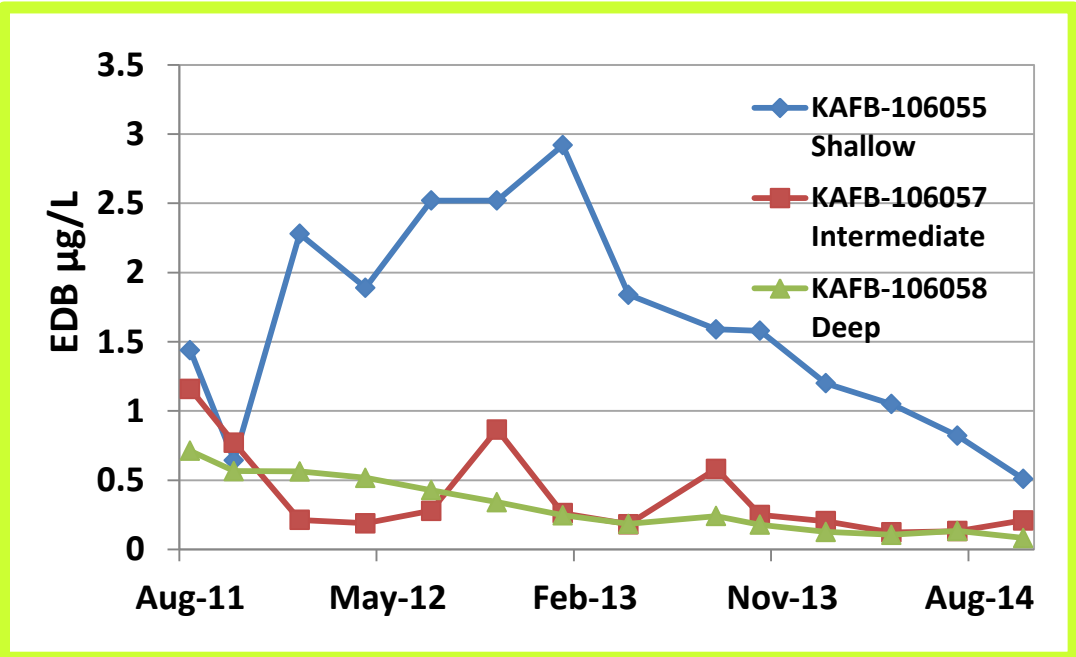
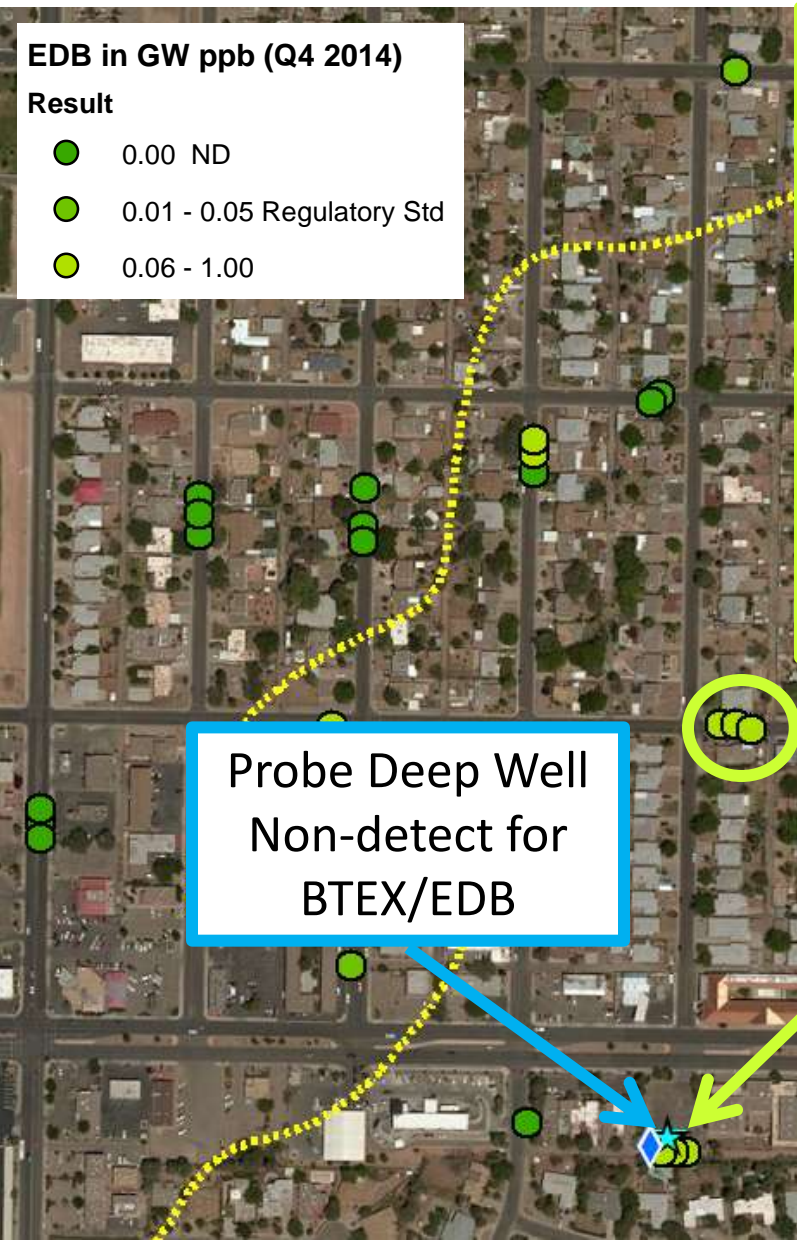
11 - 100

101 - 190

Historical Area of  
Observed  
NAPL (July 2009)

Observed  
Vacuum  
(inches of  
water)

# EDB Trends in the Distal Plume Area



# Groundwater Plume Takeaway

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- **Benzene plume is stable**
- **EDB dissolved phase plume may be migrating slowly towards the northeast with groundwater flow**
  - **Data gap wells will answer this question**
- **Public water supply wells are not at imminent risk of contamination**
- **SVE appears to have put a “dent” into the benzene and EDB groundwater plumes**



# NMED Strategic Plan Summary

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

**Strategies to Achieve the Goal:**

- 1) Continue robust groundwater and wellhead monitoring**
- 2) Collapse the dissolved EDB Plume Away from the Albuquerque Bernalillo County Water Utility Aquifer Wells**
- 3) Remediate Light Non-Aqueous Phase Liquid (LNAPL) and associated dissolved phases in the LNAPL area**
- 4) Clean up soil in the spill area**
- 5) Meet or exceed all requirements for providing public information and involvement**

# NMED Strategic Plan Comments

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**There was general agreement with the goal and strategies.**

**However:**

**“Although I agree with the goals of this plan, I have little confidence that the measures proposed here can achieve the goals before the drinking water wells become contaminated by EDB.”**

**“There is great cynicism in the community regarding KAFB's commitment to clean up this spill and our state government's efforts to hold KAFB accountable.”**

**We hear you.**

# NMED Response to Public Comments

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- Public trust and confidence must be earned
- The next 9 months is when the rubber will hit the road
- Revisit the strategies implemented by December 2015





# Critical Work for 2015

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- **Complete installation of remaining data gap wells**
- **Perform SVE rebound testing**
  - **Identify and attack hotspots**
- **Conduct in situ respiration testing**
- **Complete installation of first EDB extraction well and water treatment system, bring online by June 30, 2015**
- **Install the next three EDB extraction wells, construct full-scale treatment system, bring online by December 30, 2015**
- **Screen LNAPL remediation technologies, identify best options for lab and field pilot testing**



# Filling Data Gaps

- Installed 11 out of 16 groundwater wells to define horizontal and vertical extent of EDB plume

EDB in GW ppb (Q4 2014)  
Result

- 0.00 ND
- 0.01 - 0.05 Regulatory Std
- 0.06 - 1.00



# SVE Rebound Testing

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- **Temporarily suspend vapor extraction**
- **Monitor SVE wells for increases in vapor concentration (rebound)**
- **Attack rebounding hotspots with targeted extraction and treatment**

**Rebound testing will begin on April 6, 2015**



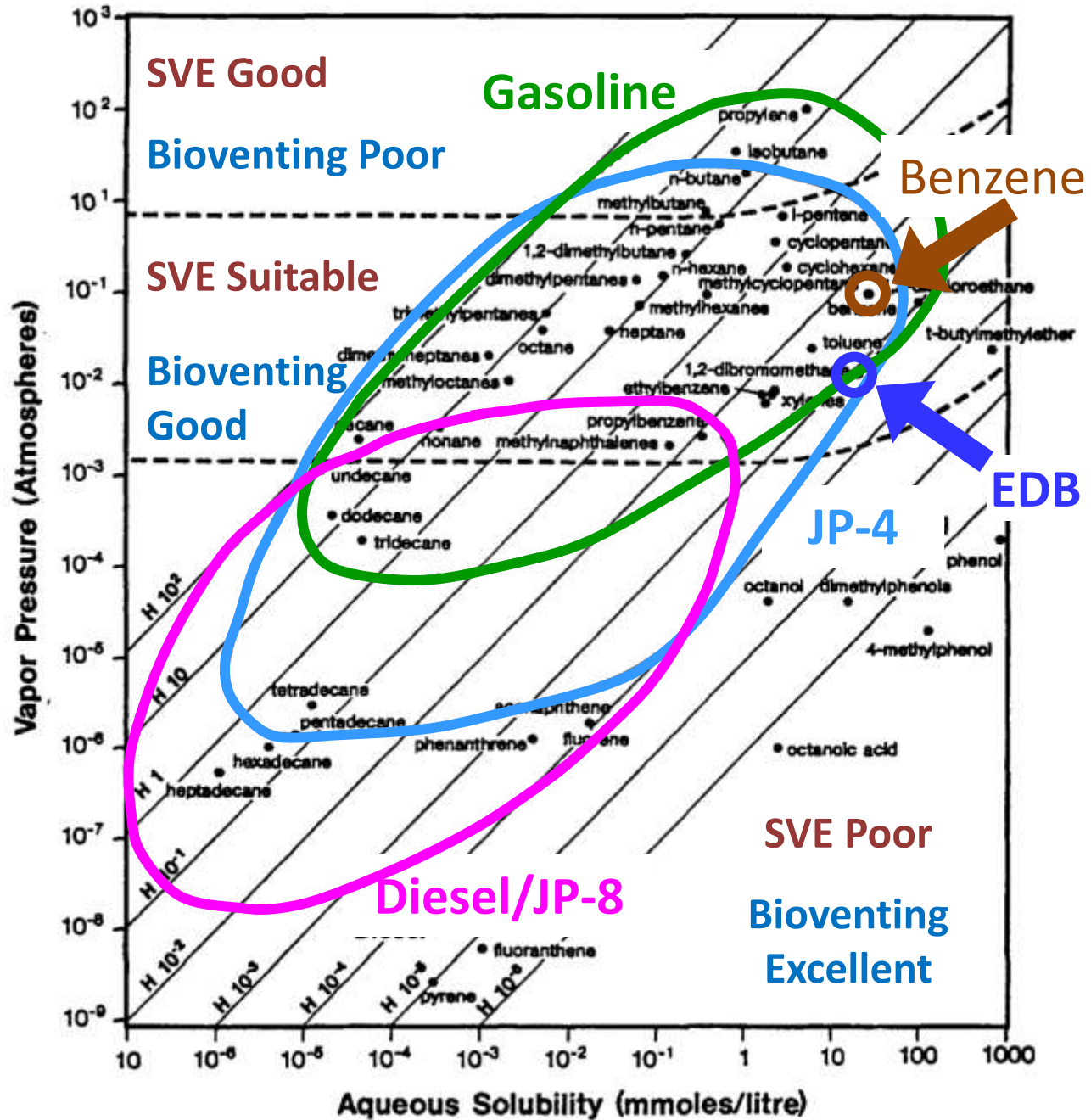
# In Situ Respiration Testing

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- **Soil bacteria consume hydrocarbons with oxygen and emit carbon dioxide**
- **Measured oxygen, carbon dioxide, and hydrocarbon vapor will help identify:**
  - **Areas for continued SVE**
  - **Areas where treatment should switch from SVE to bioventing**
  - **Areas that need no further treatment**

**Find the sweet spot for biodegradation and enhance it.**

# Suitability Ranges for SVE and Bioventing



# Collapsing the Dissolved EDB Plume

**Drill Additional  
Extraction Wells**

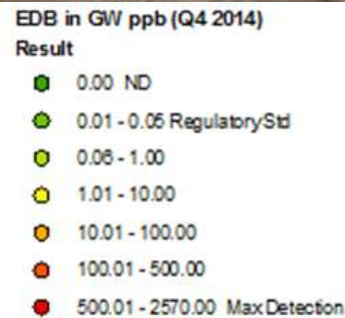
**Extraction Well**

**EDB Extracted Water  
Conveyance Line**

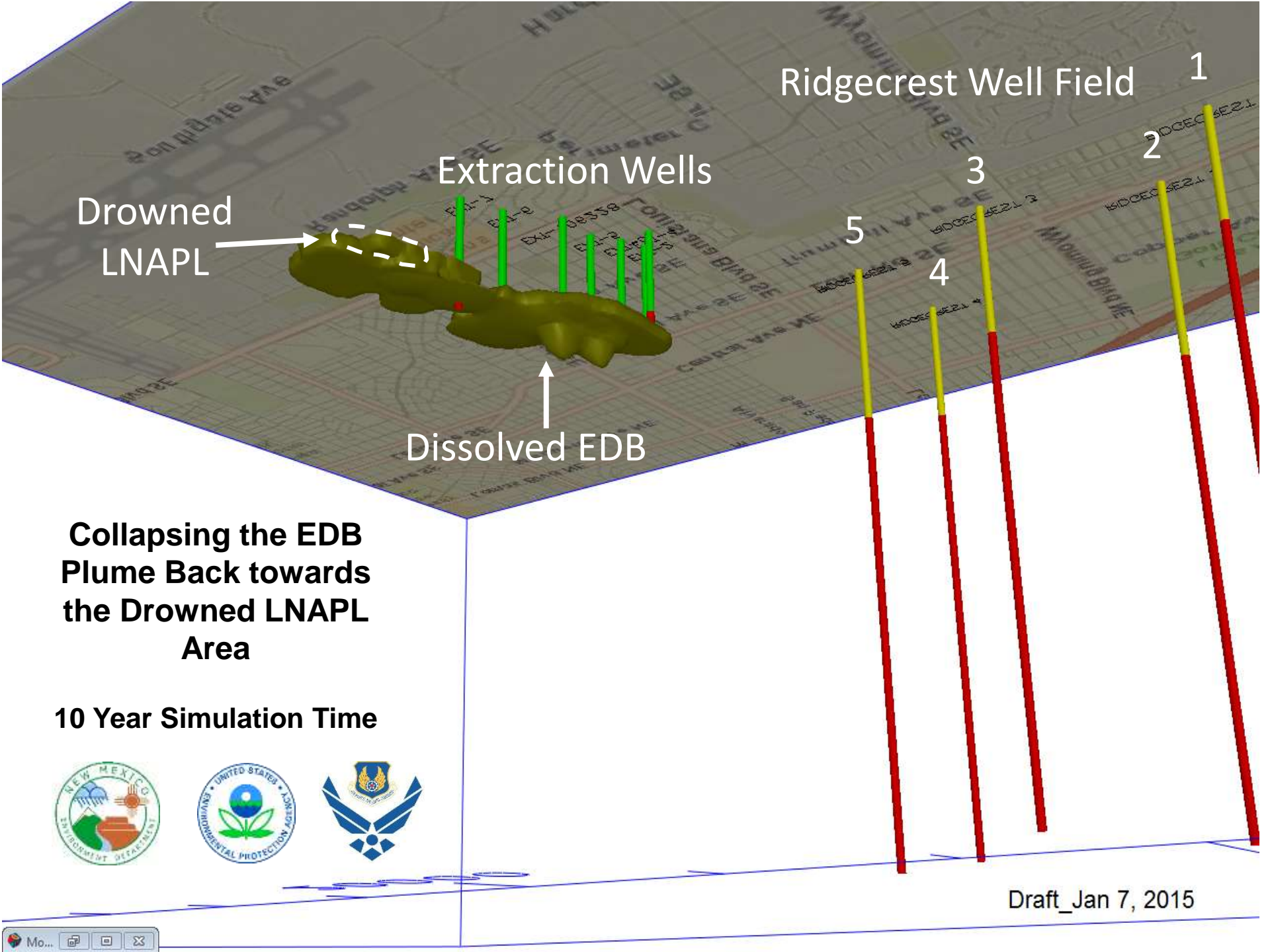
**EDB Treatment System  
Using Granular  
Activated Carbon**

**Treated Water:**

- Infiltration Gallery for Aquifer Recharge
- Landscape Irrigation
- Non-potable Reuse







Ridgecrest Well Field 1

Extraction Wells

Drowned LNAPL

Dissolved EDB

**Collapsing the EDB Plume Back towards the Drowned LNAPL Area**

**10 Year Simulation Time**



Draft\_Jan 7, 2015





# LNAPL Clean Up

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- **Technically challenging due to groundwater depth and submerged LNAPL from rising water table**
- **Screening potential technologies for interim measures**
- **Conduct laboratory and field scale pilot tests for potentially suitable technologies**

**Comprehensive laboratory testing of bioremediation and an air sparging field pilot test were completed in January 2015**

# Recap

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- **Drinking water supply wells show no contamination**
- **Groundwater contamination plumes are relatively stable**
- **Collapse of the EDB plume will begin June 30, 2015**
- **Soil vapor contaminant levels are decreasing after 12 years of SVE**
- **Soil vapor testing will begin to identify hotspots and biodegradation rates**



# Public Field Trip April 18, 2015



- Will look at sediment outcrops similar to the aquifer material, and will go to spill site.
- 10:00 a.m. - 4:00 p.m. with multiple stops with walking on uneven terrain both on and off Kirtland Air Force Base. Transportation will be provided.

# Public Field Trip April 18, 2015

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- **Information participants need to provide in advance:**
  - To get on base, you will need to provide your name, date of birth, and the last four numbers of your Social Security Number in advance for background check (must have no outstanding warrants);
  - Accommodations for persons with limited mobility;
  - This information must be provided to the AFCEC PA Office, by close of business of Friday, March 27.
- **Day of the field trip, to be held, rain or shine, bring :**
  - Photo-identification
  - Water
  - Lunch/snacks
  - Sunscreen, hat, sunglasses
  - Close-toe shoes



# Questions & Answers

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- One question/comment per turn at the microphone
- Each question/comment will be allotted 3 minutes – please respect this time limit so others will have an opportunity to be heard
- In addition, comment cards have been made available
  - Return completed comment cards to Air Force staff
  - Questions will be incorporated into the FAQ portion of the Kirtland AFB BFF Spill project website:  
[www.kirtlandjetfuelremediation.com](http://www.kirtlandjetfuelremediation.com)

# How do I get up to date information on the BFF spill?

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## Project updates:

BFF-specific spill website: [www.kirtlandjetfuelremediation.com](http://www.kirtlandjetfuelremediation.com)

## Contact us:

Air Force Civil Engineer Center

Office of Public Affairs

2261 Hughes Ave, Ste 155

Joint Base San Antonio-Lackland TX 78236-9853

(210) 925-0956 or (866) 725-7617

Email: [afcec.pa@us.af.mil](mailto:afcec.pa@us.af.mil)

Air Force Environmental Restoration Program documents at the Kirtland AFB Information Repository in the Central New Mexico (CNM) Community College-Montoya Campus Library, 4700 Morris NE, (505) 224-5721

or

Kirtland AFB website at <http://www.kirtland.af.mil> in the Environmental Issues section for Public Records.