

Kirtland Air Force Base Bulk Fuels Facility Leak Cleanup

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**UNM Water and Energy Lecture Series
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Site History

- The Kirtland Air Force Base (KAFB) Bulk Fuels Facility (BFF) is located in the northwestern portion of the base and began operation in 1953.
- BFF was the fueling area for the installation and received bulk shipments of fuel from railcars and trucks.
- An underground pipeline extending from the fuel off-loading area to the fuel pump house gradually leaked jet fuel into the ground.
- The leak was discovered in 1999 and KAFB sealed off the underground pipe and removed it from service.
- The KAFB fuels facility was replaced in 2011 with all above-ground piping and tanks along with state-of-the-art leak detection technology.

1999 Leak Photos at BFF

Metal Stair Step

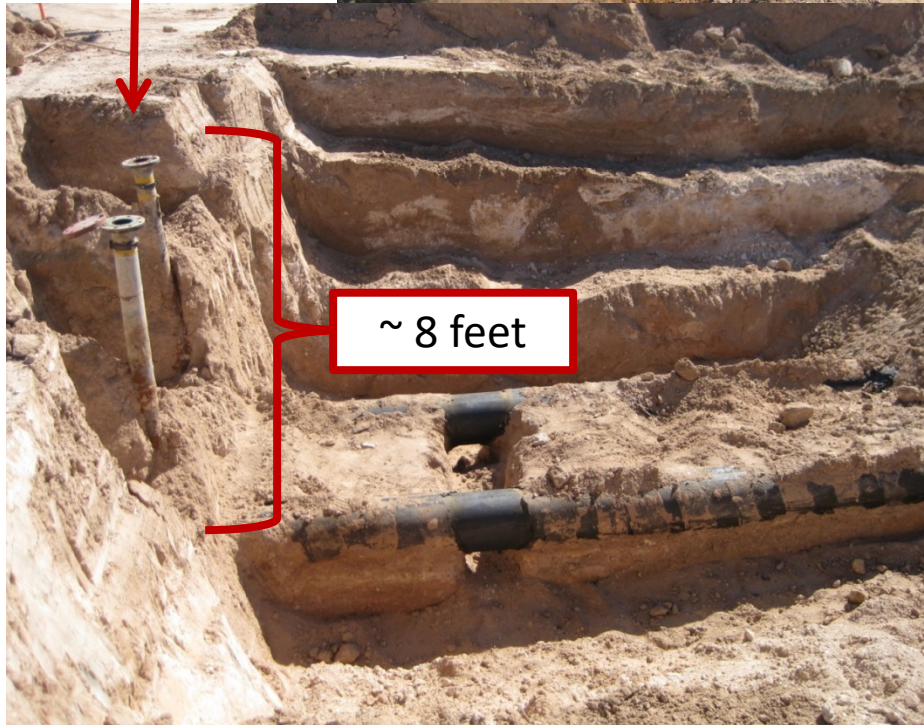


Removal of Piping 2010 Photos

Pipe Connect
into the Pump
House Building



Hole in Bottom
of Transfer Pipe

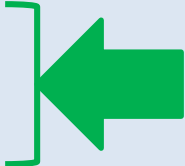


~ 8 feet



Pipe Bent
when Removed
from Trench

Regulatory Framework

- The New Mexico Environment Department (NMED) governs the fuel leak site through the administration of two federal acts:
 - Safe Drinking Water Act (SWDA)
 - Resource Conservation and Recovery Act (RCRA)
 - Site activities are being completed under the Corrective Action provision of RCRA and KAFB's permit:
 - Site Investigation
 - Interim Measures (IMs)
 - Corrective Measures Evaluation (CME)
 - Corrective Measures Implementation (CMI)
-  The BFF project is here

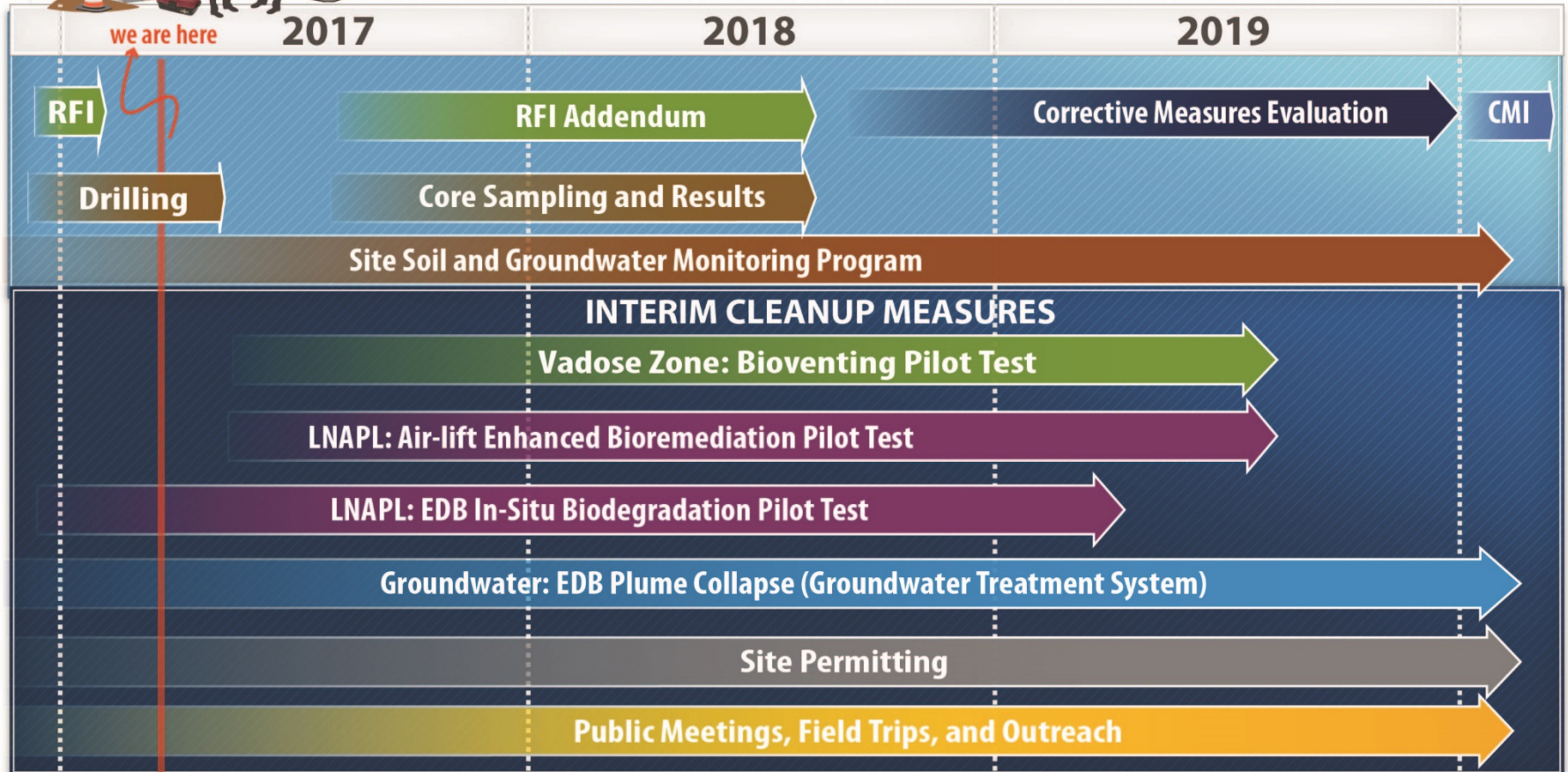
RCRA Facility Investigation (RFI) Report

- The RFI has three major areas of concern, as detailed in NMED's August 3, 2017 letter
 - Incomplete characterization of the dissolved-phase groundwater plume(s)
 - Technically incomplete and biased concentration trend analysis and estimation of degradation rates
 - Incomplete delineation of vertical and horizontal extent of light non-aqueous phase liquid (LNAPL)
- The Technical Working Group met on September 6-8, 2017 to discuss RFI issues
- NMED will formally submit comments on the RFI path forward via letter in October 2017

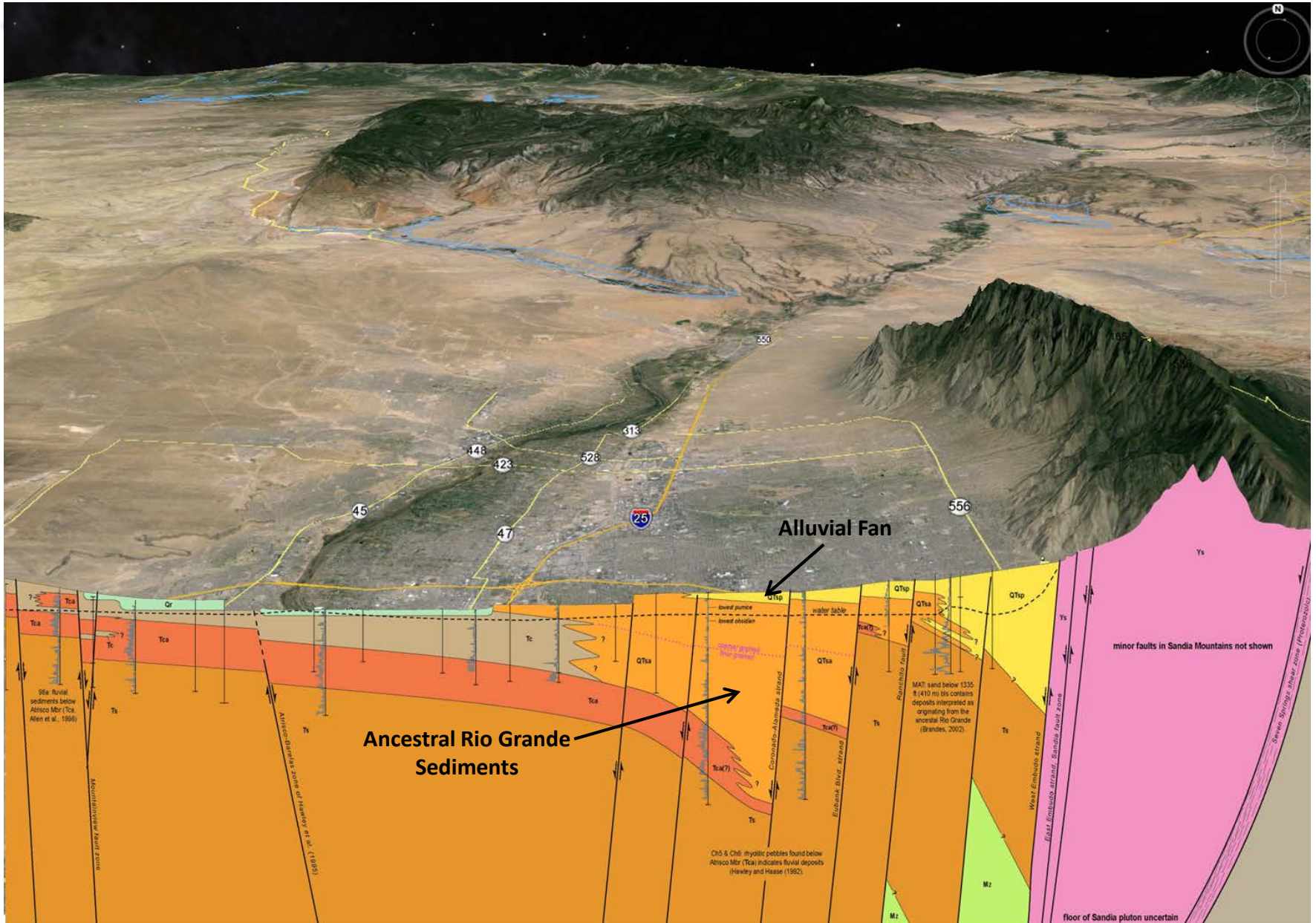
What's next for the RFI Report?

- RFI Report will be refined and improved, including:
 - Revisions to January 2017 RFI Report
 - Submittal of an RFI Addendum with additional data to be collected to close data gaps and update site conceptual model
- Data collection will be based on a series of work plans that are in production now and will be submitted for NMED review and approval
- In this way, the earlier submitted RFI with 2015 data can be made dynamic to reflect the water table levels of 2017 along with current and planned activities.

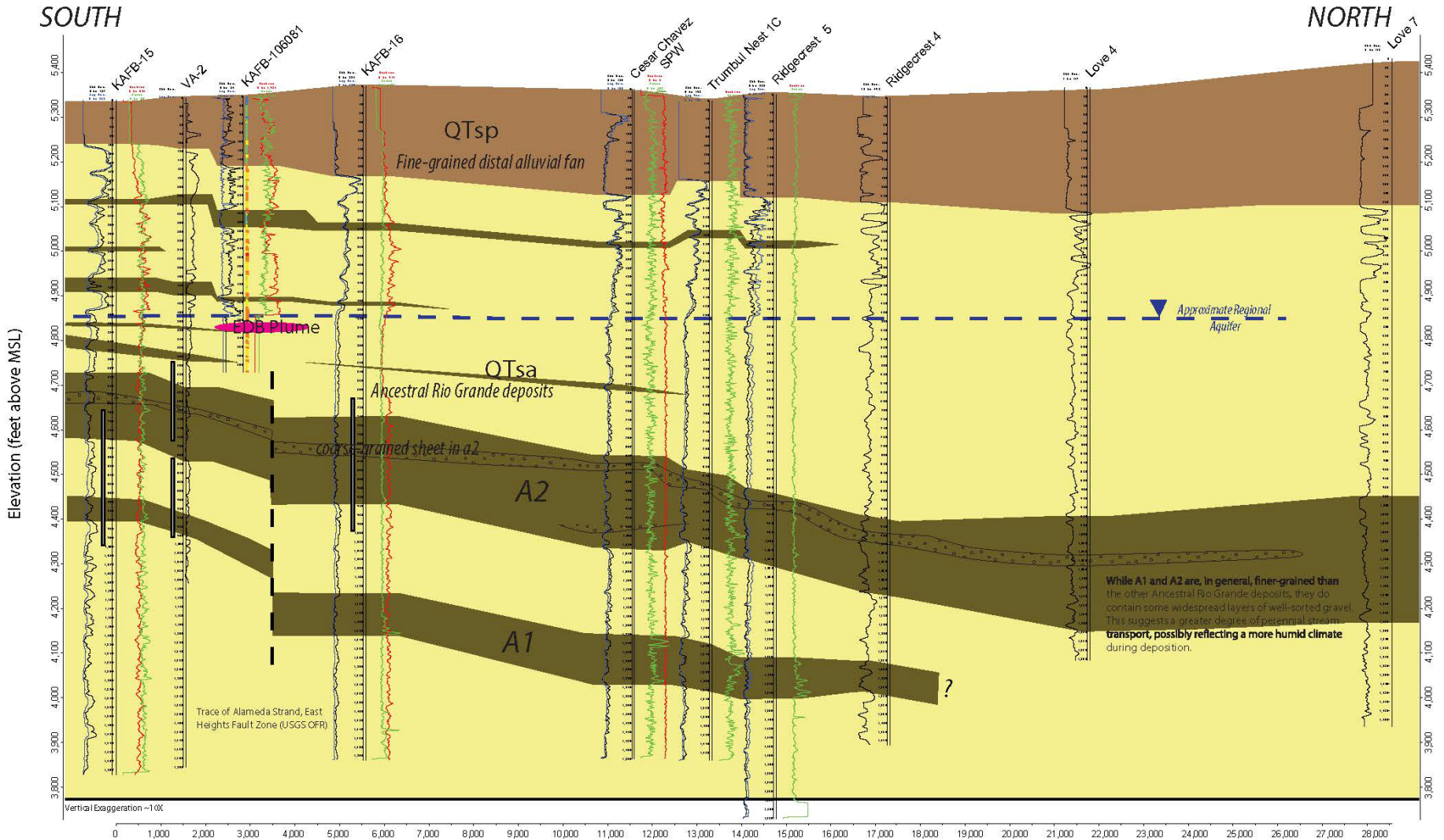
Current Project Timeline



Understanding the Hydrology



Regional Scale Geology

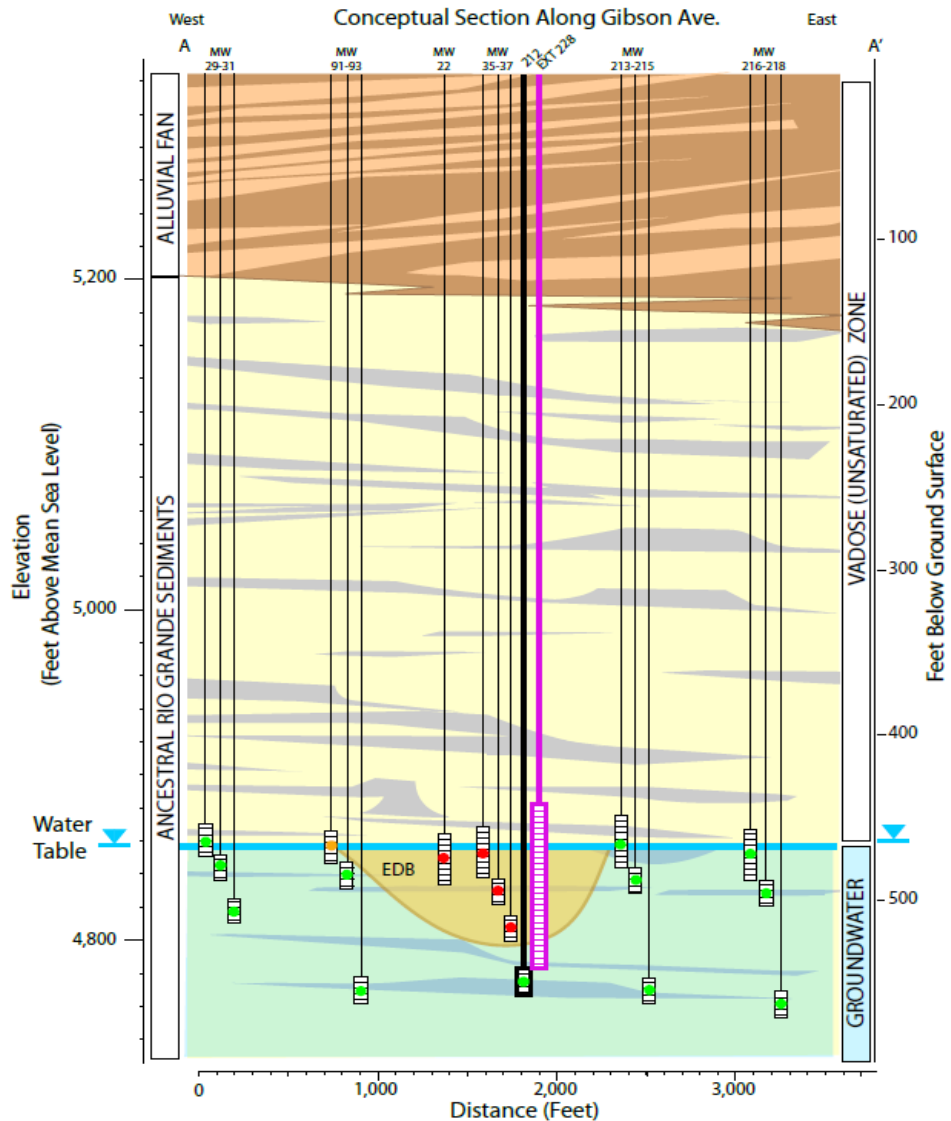
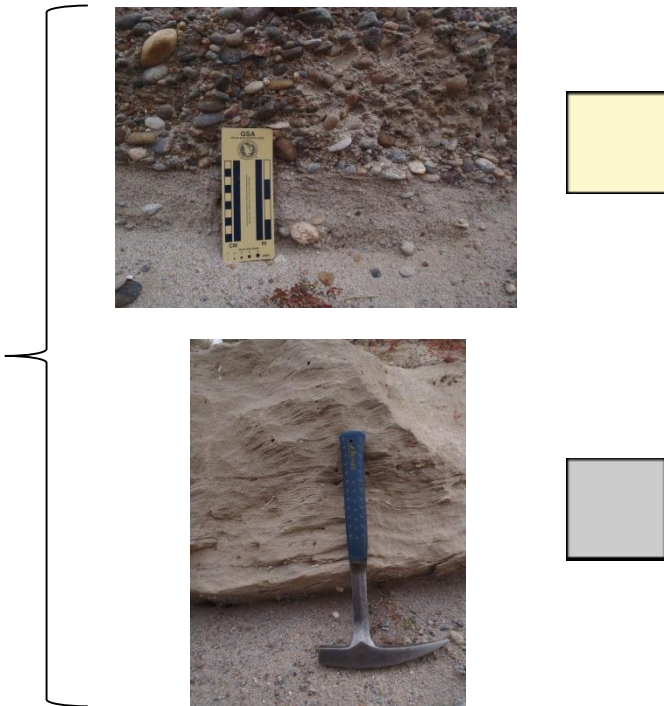


Understanding the Geology

Alluvial Fan Deposits

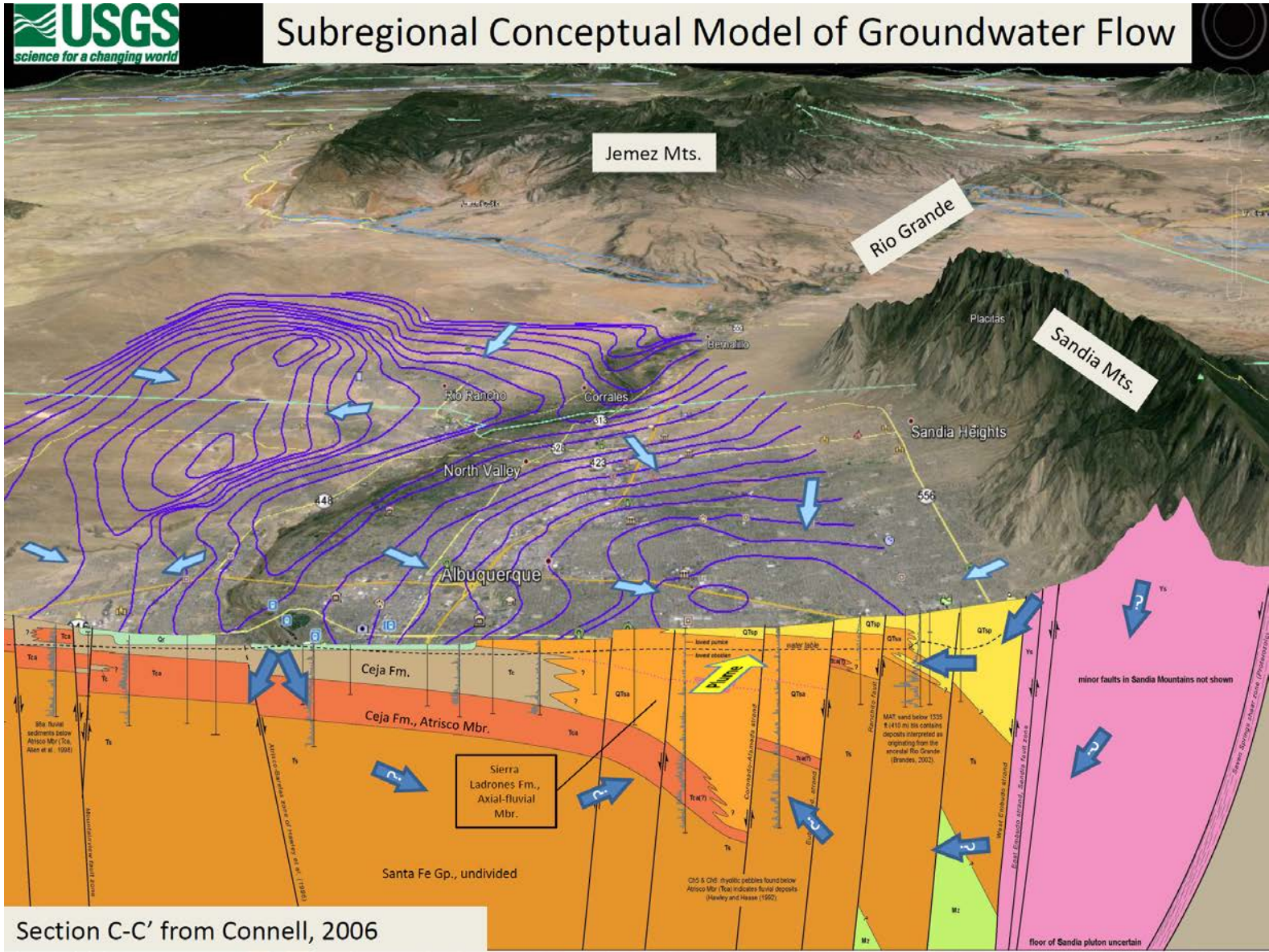


Ancestral Rio Grande Braided River Deposits



Conceptual Site Model

<https://www.env.nm.gov/NMED/Issues/KirtlandFuelPlume/KAFBProjectImages.html>

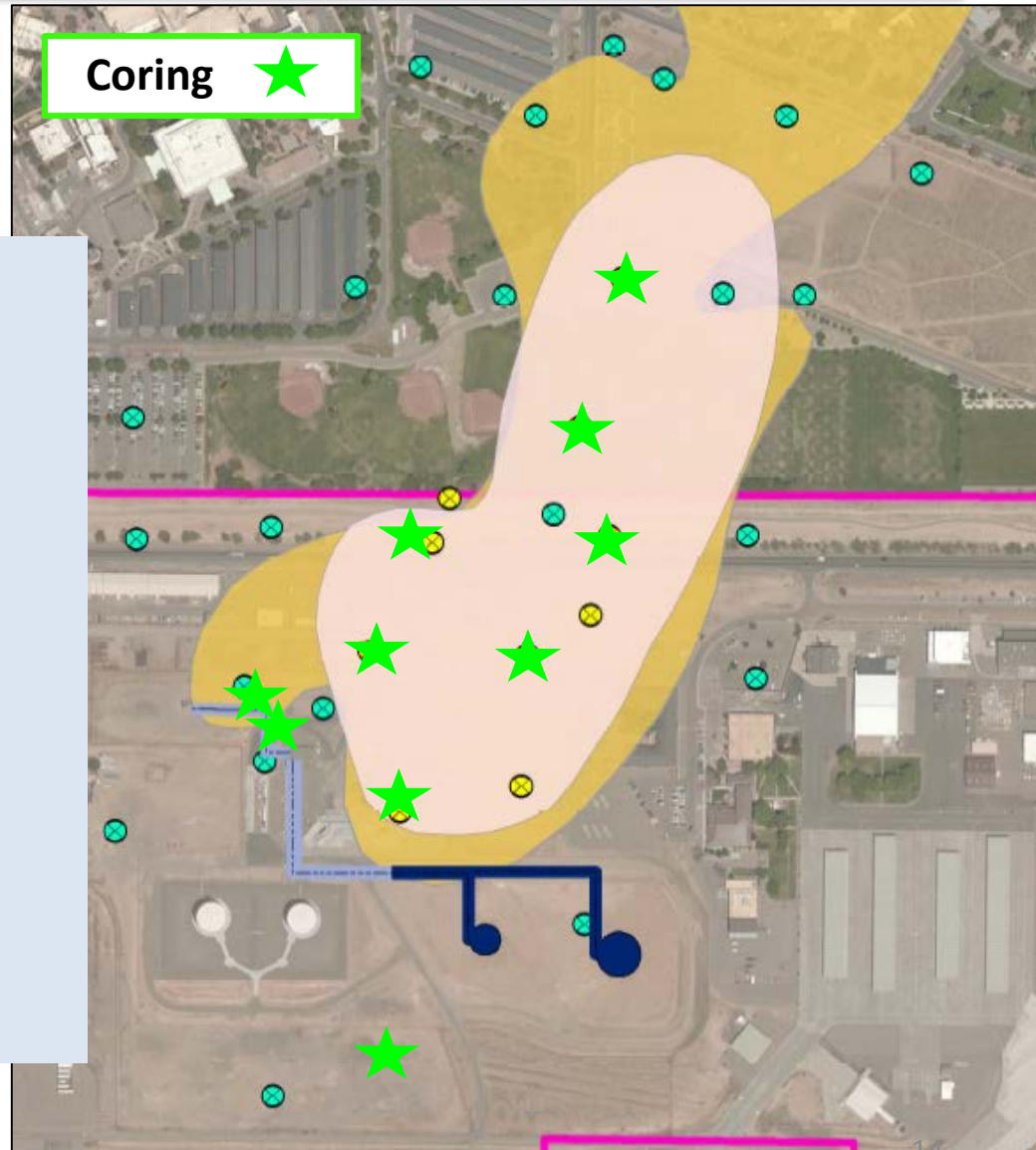


Conceptual Site Model

- As we continue to collect data, we are able to further refine the conceptual site model
 - *Vadose zone*: Collection of continuous cores in the unsaturated zone to refine soil vapor rebound test results and evaluate the nature of LNAPL suspended in the soil
 - *Groundwater*: Rising water table necessitates additional wells to evaluate EDB plume mass. Continuous core samples within the saturated soil will refine understanding of “drowned” LNAPL.

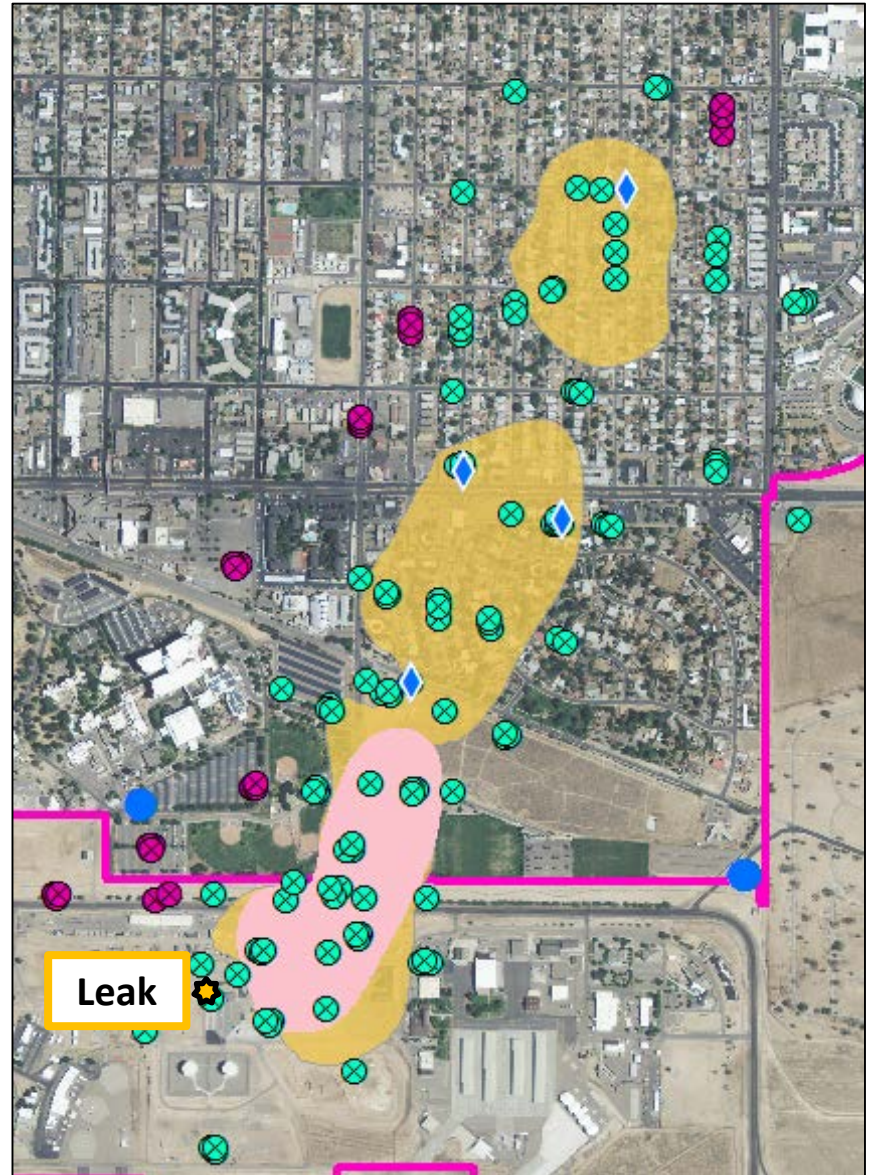
2017 LNAPL Data Gaps

- Interim measure
bioslurping removed LNAPL
- Water table fall and rise



Plume Anatomy

Source Area Definition



What's Next for Site Investigation?

- Site Investigation Report (RFI Report) currently in NMED review
- Groundwater and LNAPL data gaps will remain
- Refinement of site conceptual model and understanding of contaminant fate and transport
 - Incorporating of data gap results
 - Results from operation of interim measures key

Groundwater Remediation

- Technical working groups met to resolve two issues:
 - Source control (primary and secondary)
 - Protection of human health and the environment through cleanup to regulatory standards
- Technologies evaluated include:
 - Pump and treat
 - Air sparging
 - Permeable reactive barriers
 - Monitored natural attenuation
 - Enhanced bioremediation - recirculation

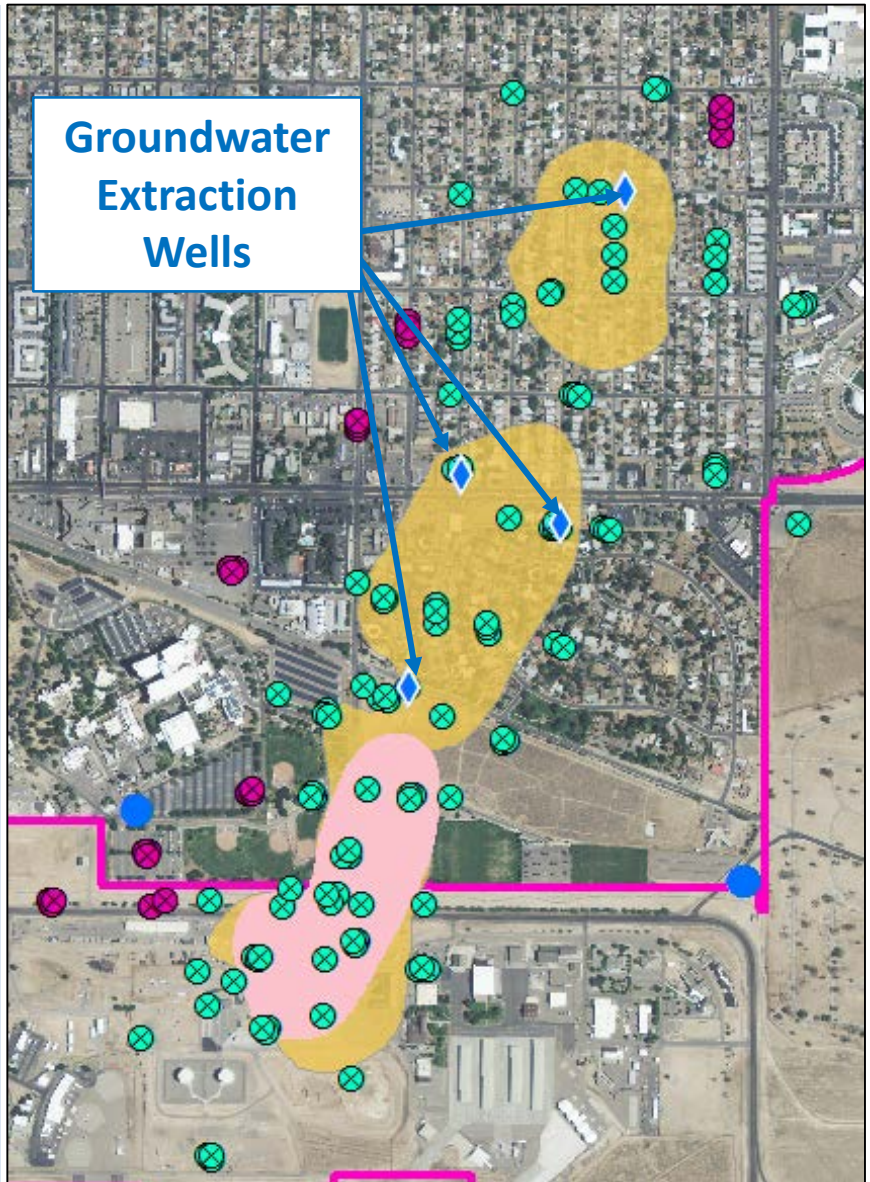
Remediation is **NOT** one-size fits all. Key factors include:

- Site geology and hydrology
- Depth of contamination
- Infrastructure requirements
- Cost

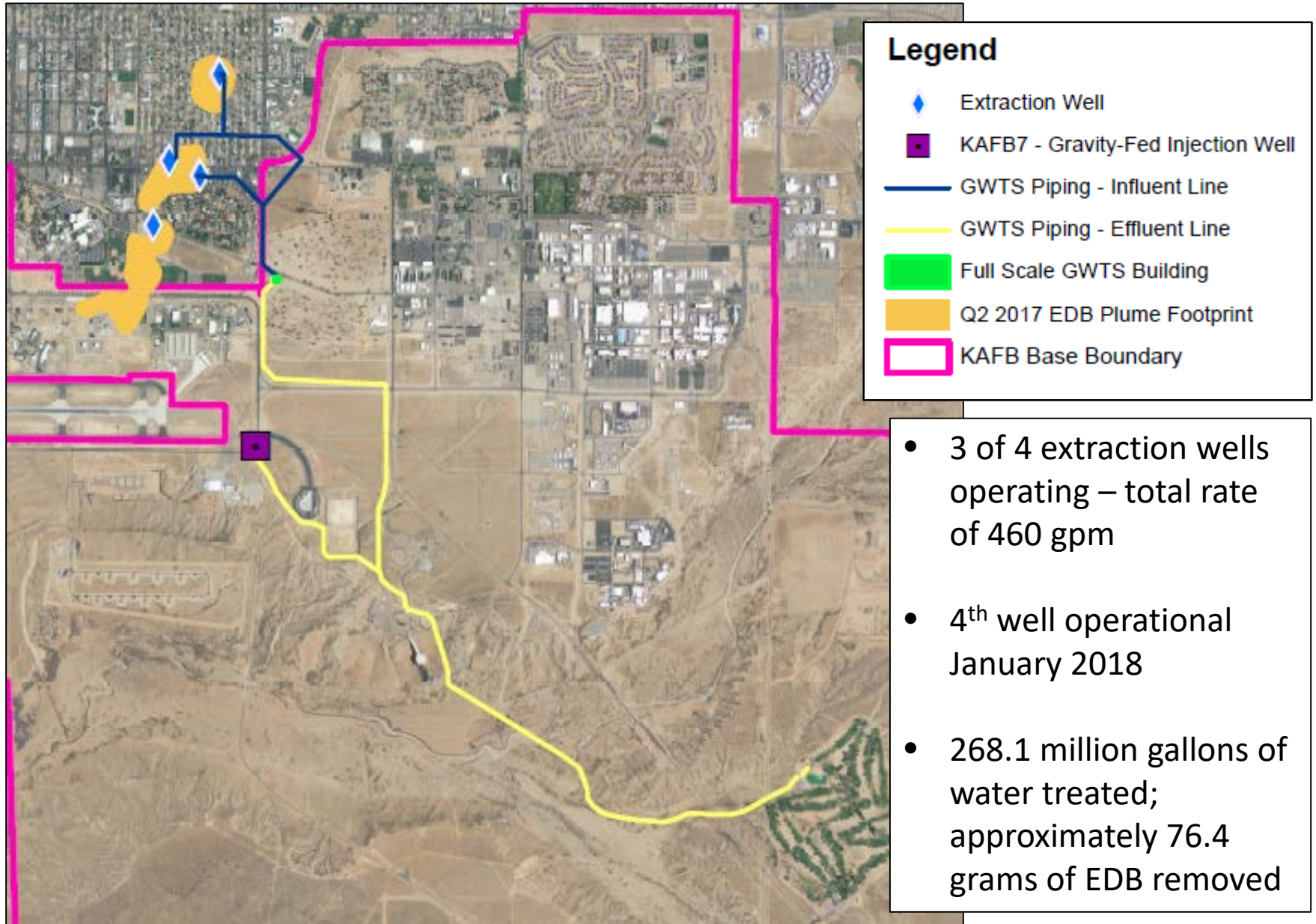
Interim Measure Strategies at BFF

Source Removal

Soil remediation...



EDB Plume Collapse

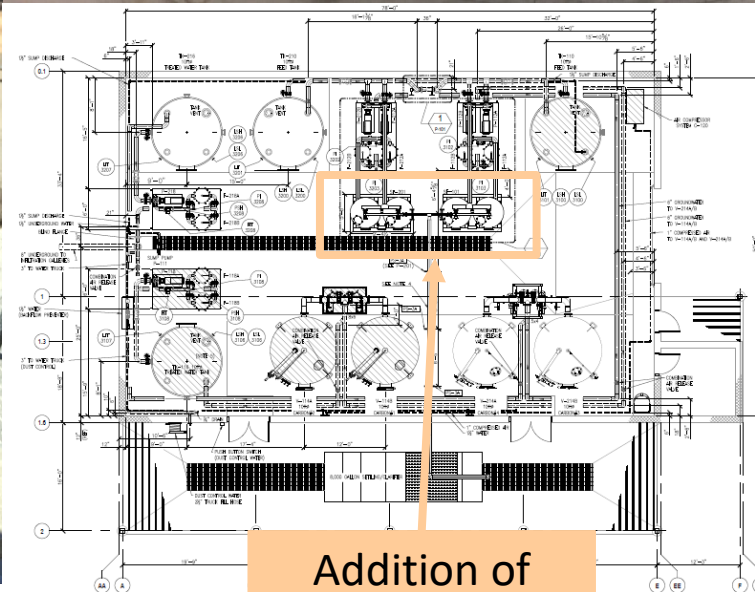


Groundwater Treatment System

4 20,000 pound granular activated carbon (GAC) Tanks in operation



Sacrificial anode added to extraction wells to prevent corrosion



Addition of Sand Filters Pre-Treatment



What's next for EDB Plume Collapse?

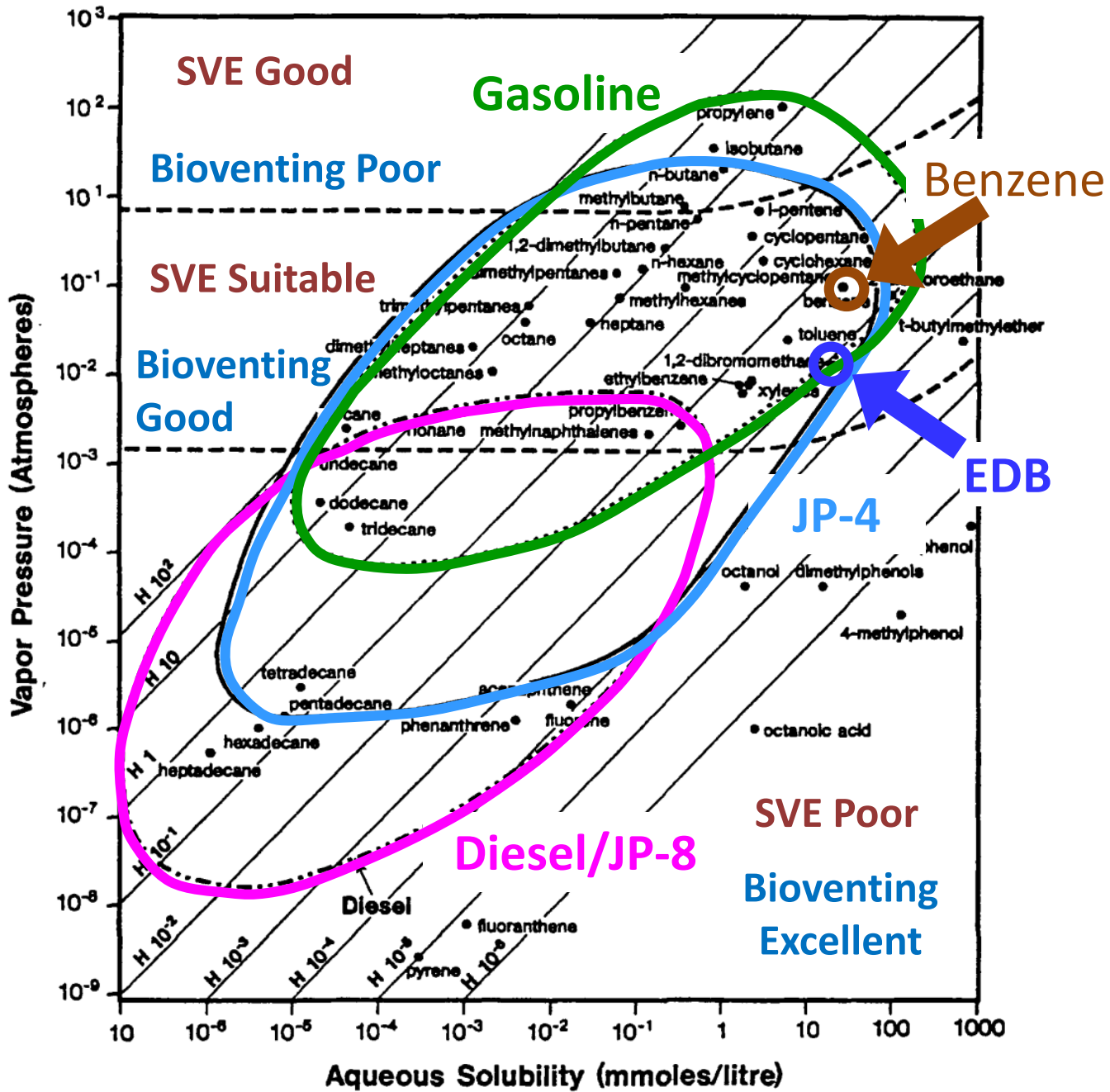
- Construction of conveyance pipeline from new extraction well KAFB-106239 on Ridgecrest Dr. to GWTS
- Operate GWTS with all 4 extraction wells
- Refinement of plume capture evaluation through tracking multiple lines of evidence

Vadose Zone Remediation

- A technical working group specific to the vadose zone was tasked with addressing:
 - Source removal
 - Protection of human health and the environment
- Currently evaluating multiple technologies:
 - Soil Vapor Extraction
 - Bioventing
 - Natural attenuation

Remediation is **NOT** one-size fits all and evolves as the contaminant is cleanup overtime. Key factors include:

- Natural Conditions (aerobic vs anaerobic)
- Effectiveness and Efficiency
- Sustainability and Cost



H = Henry's Law Coefficient (atm · m³/mole)

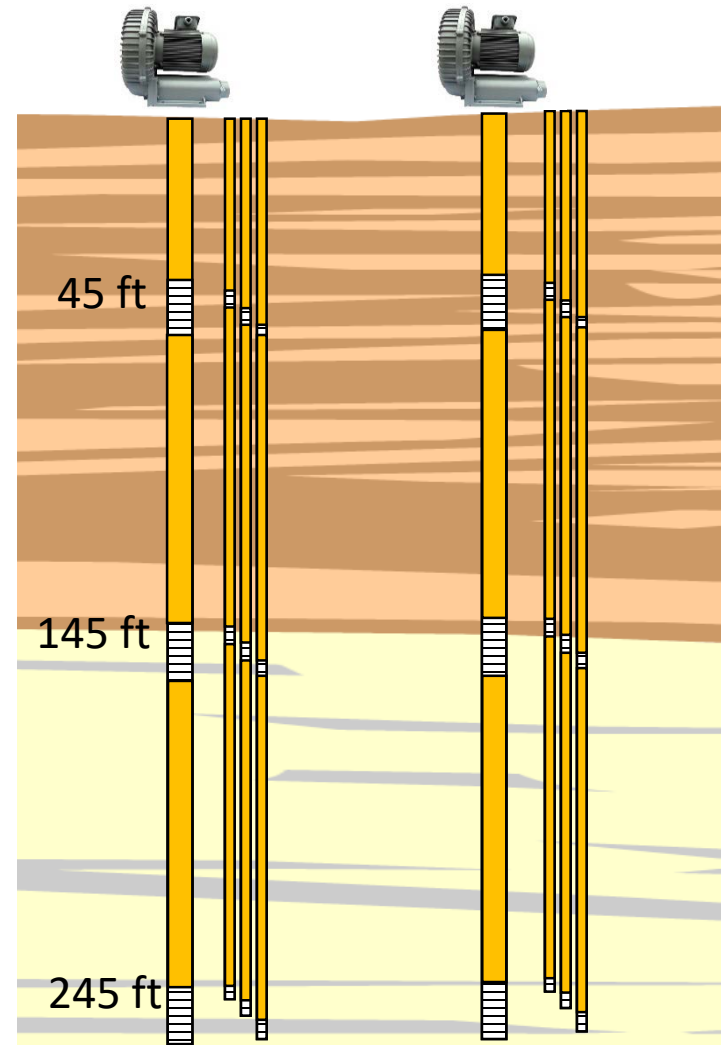
2017 Vadose Zone Interim Measure

- Bioventing area targeting rebound zone 50 – 300 feet below ground surface
- Aerobic degradation fuel and cometabolism EDB



SVEW-6, -7, -8

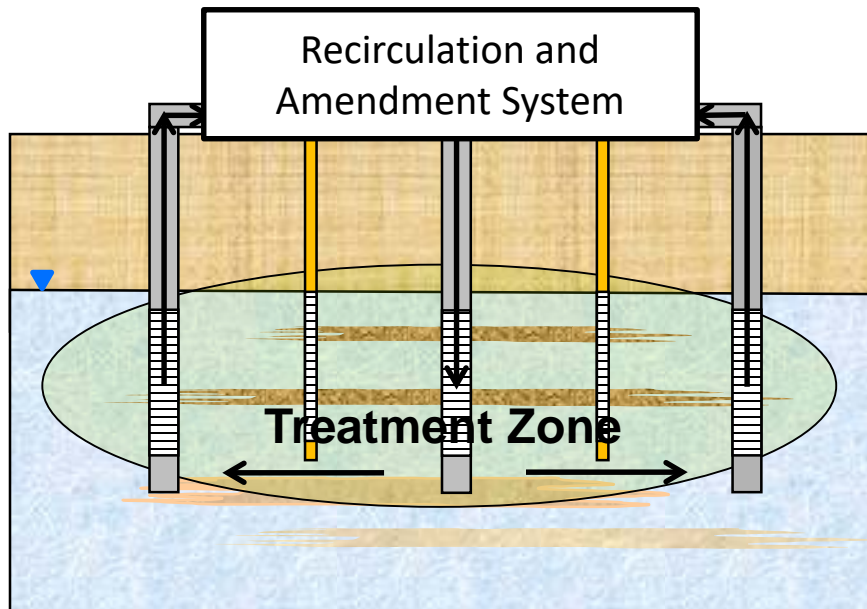
SVEW-1, -2, -3



2017 LNAPL Interim Measures

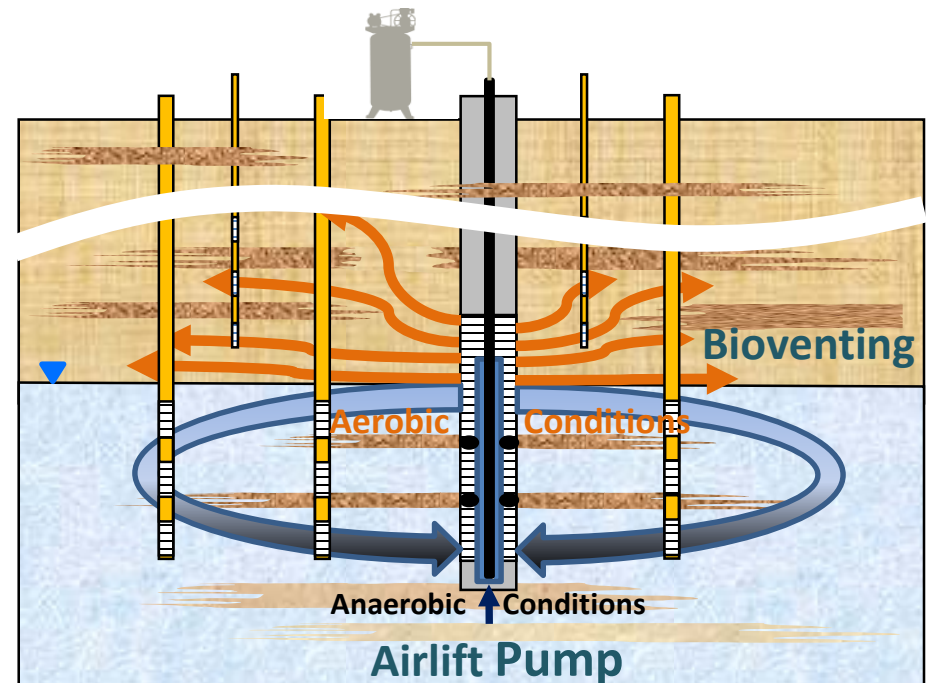
EDB In Situ Biodegradation

- Treating EDB trapped in smeared LNAPL through anaerobic biodegradation



Air-lift Enhanced Bioremediation

- Treating smeared LNAPL through aerobic biodegradation



EDB In Situ Biodegradation Pilot Test

- Field activities began in



Legend

- Groundwater Monitoring Well
- ESTCP Proposed Injection Well
- ESTCP Proposed Observation Monitoring Well
- ESTCP Proposed Extraction Well

What's in Store for BFF?

- Formal NMED comments on RFI and Risk Assessment Reports (Fall 2017)
- Completion of Phase 1 of the In Situ Biodegradation Pilot Test (Fall/Winter 2017)
- Continuous coring in the source area (Winter 2017)
- Submittal of work plan to NMED for the installation of groundwater monitoring wells (Winter 2017)

Next Project Update Public Meeting with Technical Deep Dive

November 14, 2017

5:30 – 8:00 p.m.

African American Performing Arts Center

Discussion

