

Kirtland Air Force Base Fuel Spill Cleanup

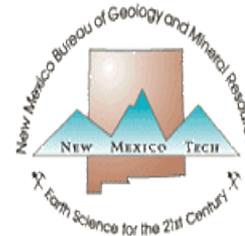
October 15, 2015



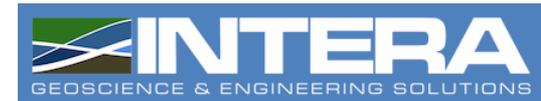
Prepared by
Dennis McQuillan, Chief Scientist
and
Diane Agnew, Hydrogeologist

A Partnership for Success

A collaborative technical team is solving the complex hydrogeologic and engineering challenges posed by fuel spill



US Army Corps of Engineers

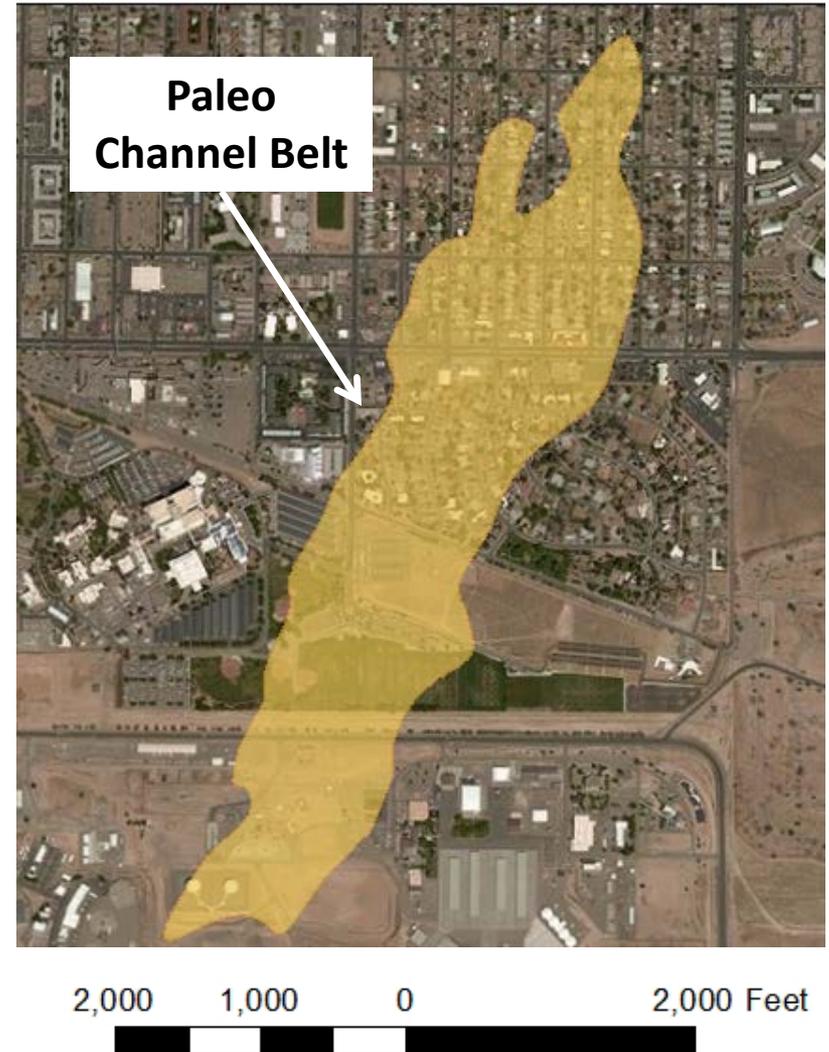


Rio Grande Braided Stream Channel Belt

Rio Grande Braided Stream
In Albuquerque South Valley



Shallow EDB Plume

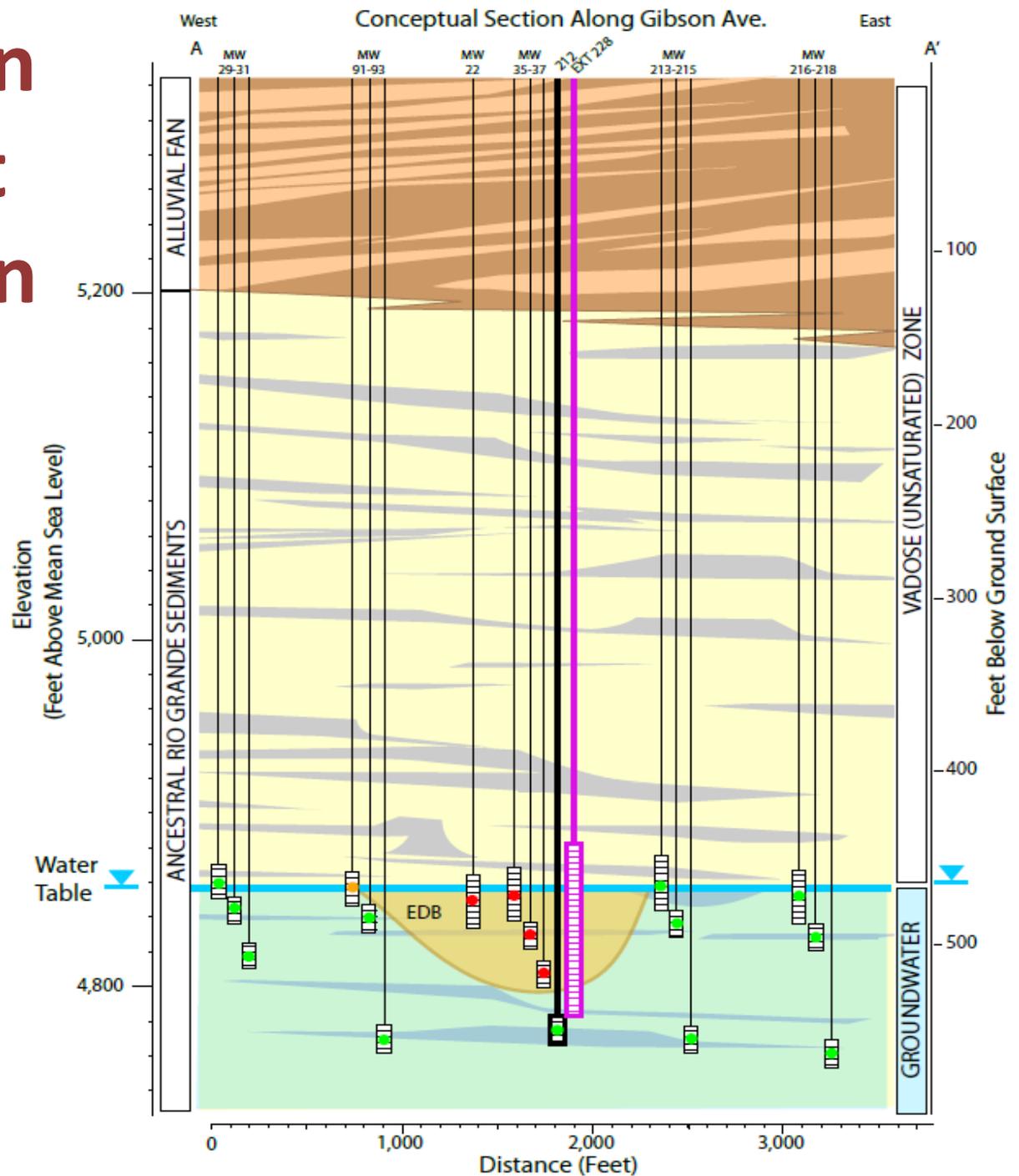
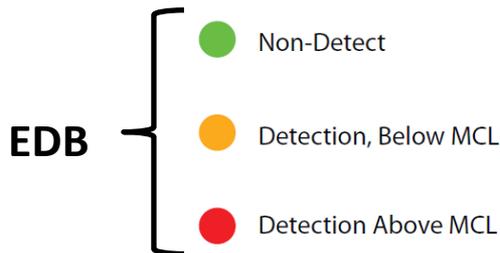
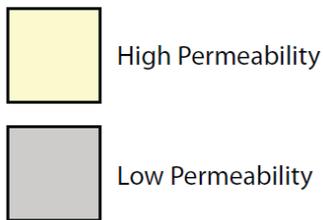


Cross Section ~ West-East Along Gibson

Alluvial Fan Sediments



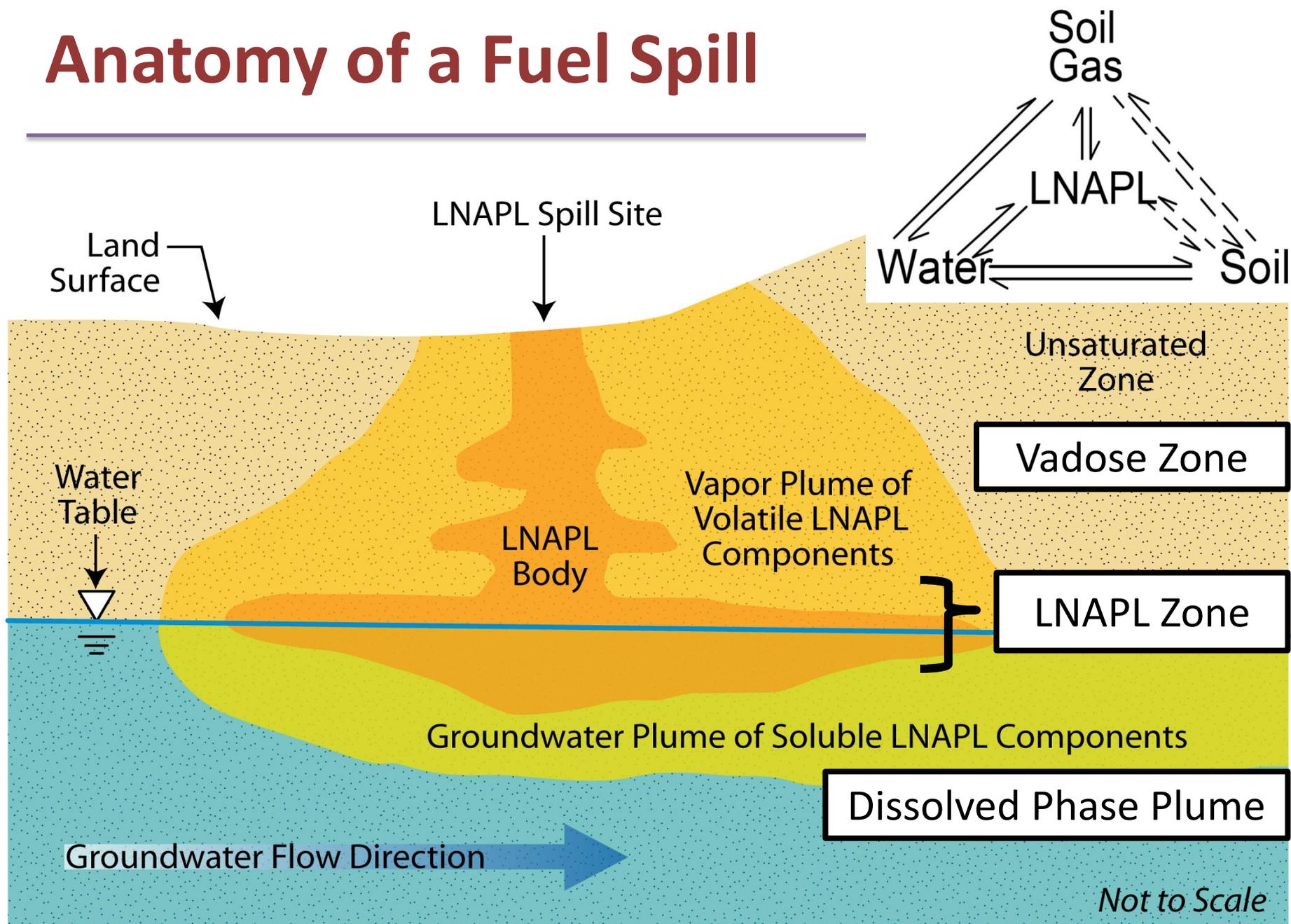
Ancestral Rio Grande Sediments



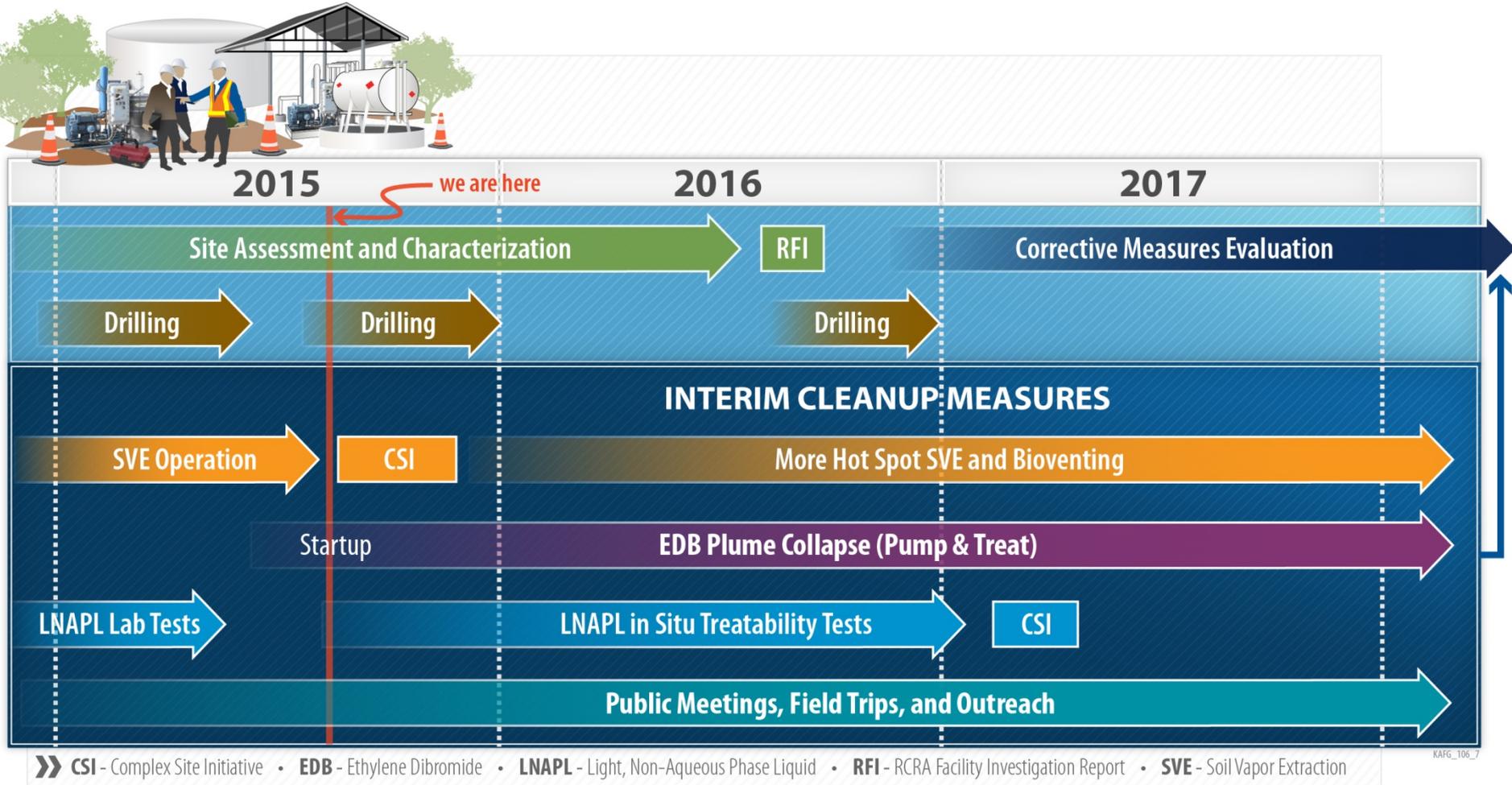
KAFB Fuel Spill History

- **1951-53** – Kirtland Air Force Base (KAFB) Bulk Fuels Facility (BFF) constructed
- **1999** – KAFB notified NMED of soil contamination from underground piping leak, and ceased use of piping
- **2001** – KAFB notified NMED of groundwater contamination with dissolved fuel constituents
- **2003** – Soil vapor extraction (SVE) begins to vacuum contaminants from soil
- **2007** – Fuel (light non-aqueous phase liquid, LNAPL) discovered floating on groundwater
- **2009** – Water level rise begins to submerge LNAPL within aquifer
- **2014-15** – Inter-agency partnership, additional interim measures
- **2015** – Groundwater cleanup begins

Anatomy of a Fuel Spill



RCRA Corrective Action Timeline 2015-17



Regulatory Basis

The New Mexico Environment Department (NMED) has been granted primacy by the U.S. Environmental Protection Agency to administer:

- **The Safe Drinking Water Act (SDWA) program; and**
- **The Resource Conservation and Recovery Act (RCRA) program**

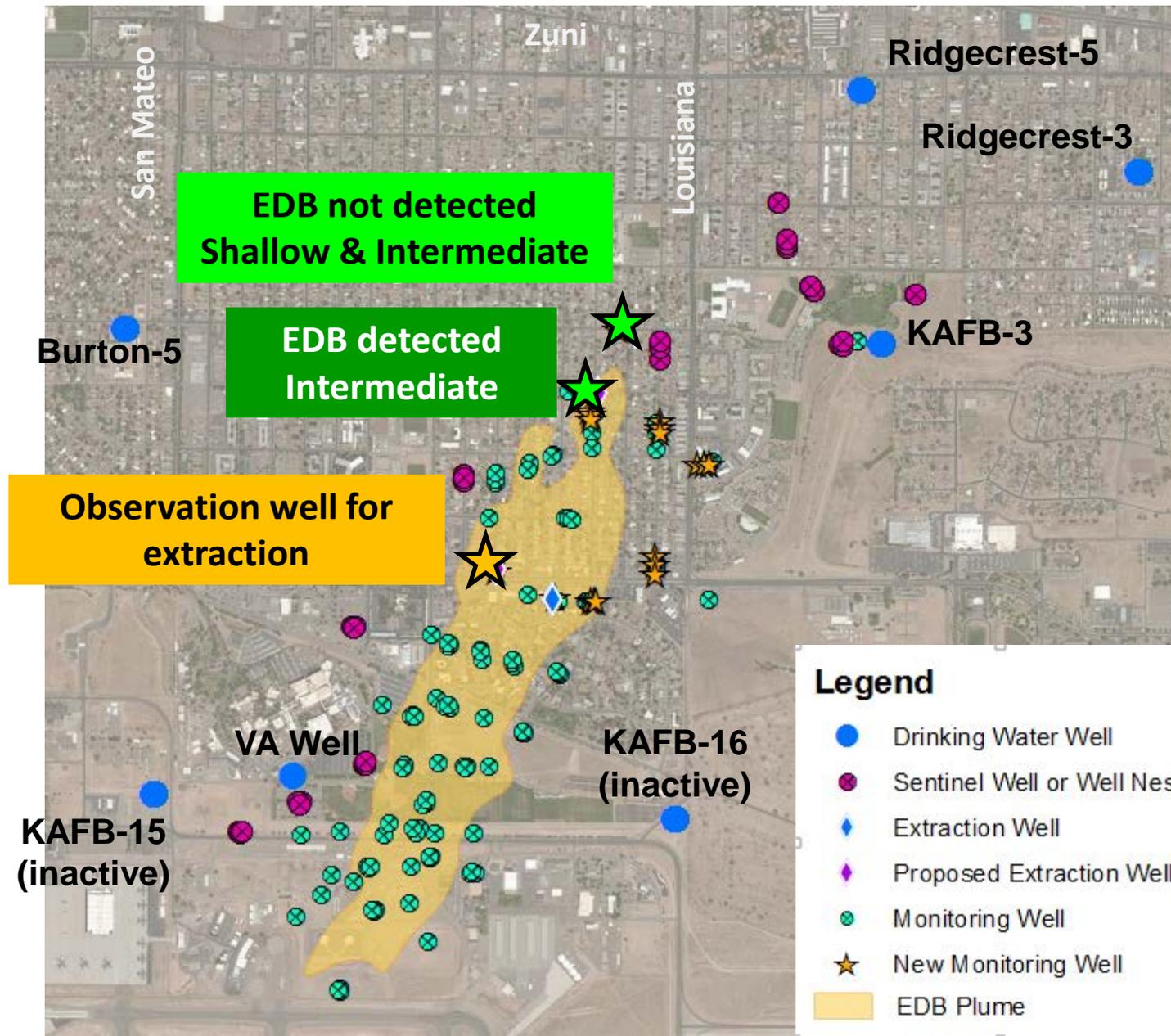
Public water systems, the ABC Water Utility Authority, Kirtland AFB and the VA Hospital, must deliver water to consumers that meets SDWA standards.

Kirtland AFB must comply with their RCRA Hazardous Waste Permit, including the Corrective Action Process.

Monthly Wellhead Testing Shows No Drinking Water Contamination



Protecting Drinking Water Wells



Collapsing the EDB Plume

2nd and 3rd
Extraction
Wells (2015)

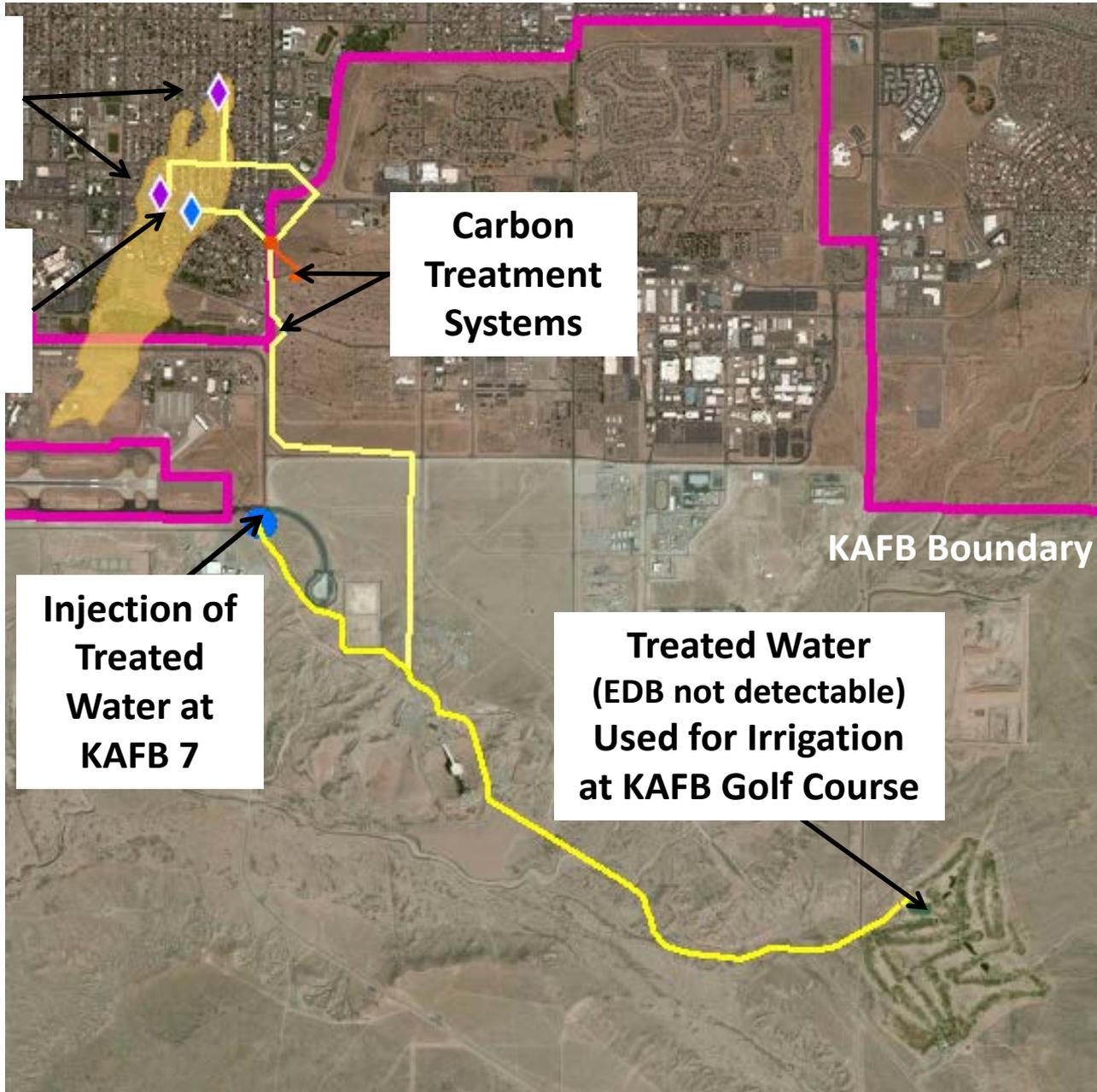
First
Extraction
Well

Carbon
Treatment
Systems

KAFB Boundary

Injection of
Treated
Water at
KAFB 7

Treated Water
(EDB not detectable)
Used for Irrigation
at KAFB Golf Course



Groundwater Pump-and-Treat Full-Scale System



Excavation and leveling of building pad



Pouring of floor of building



GAC tanks and building walls

Pump on skid for full-scale treatment system

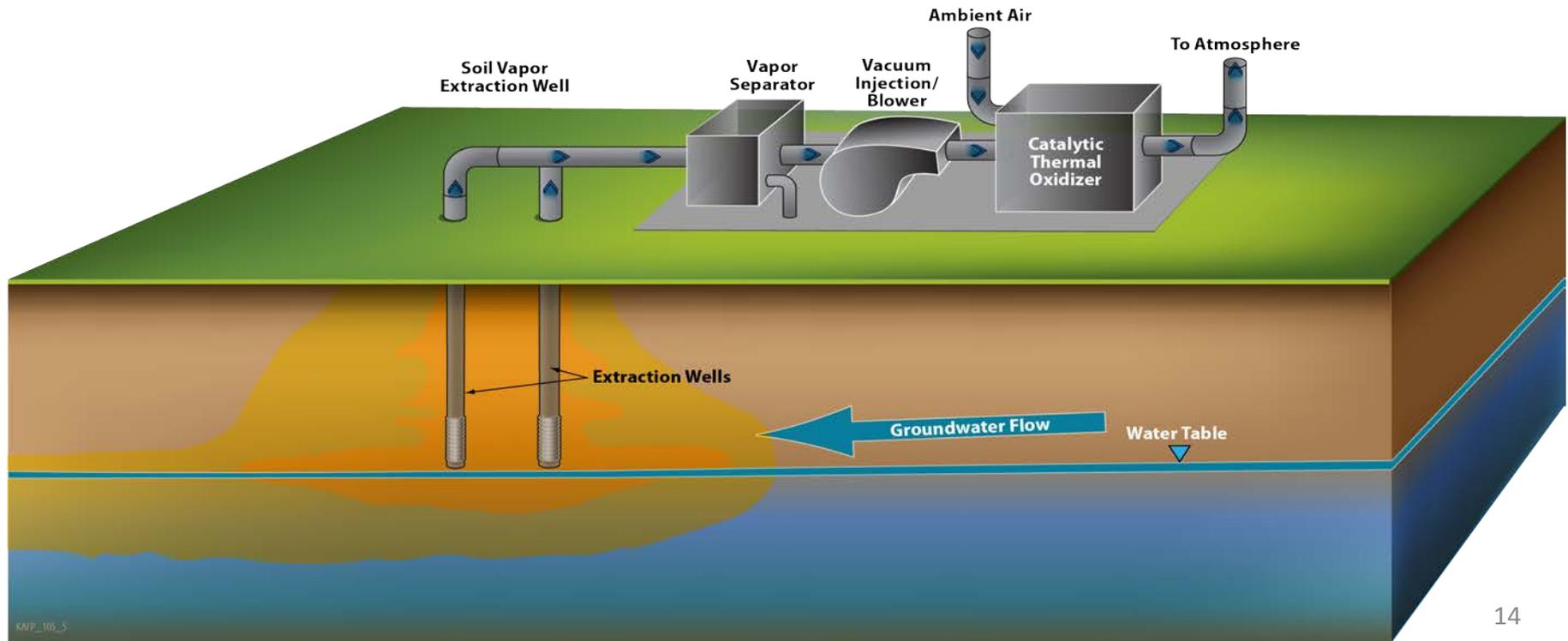


Discharge point at Tijeras Golf Course pond on Kirtland AFB



Soil Vapor Extraction

- More than 600,000 gallons of fuel recovered by SVE
- After 12 years of SVE, soil vapor concentrations are decreasing
- Vapor is treated in accordance with City of Albuquerque Air Quality Permit requirements
- SVE rebound and bio-respiration testing completed in July 2015



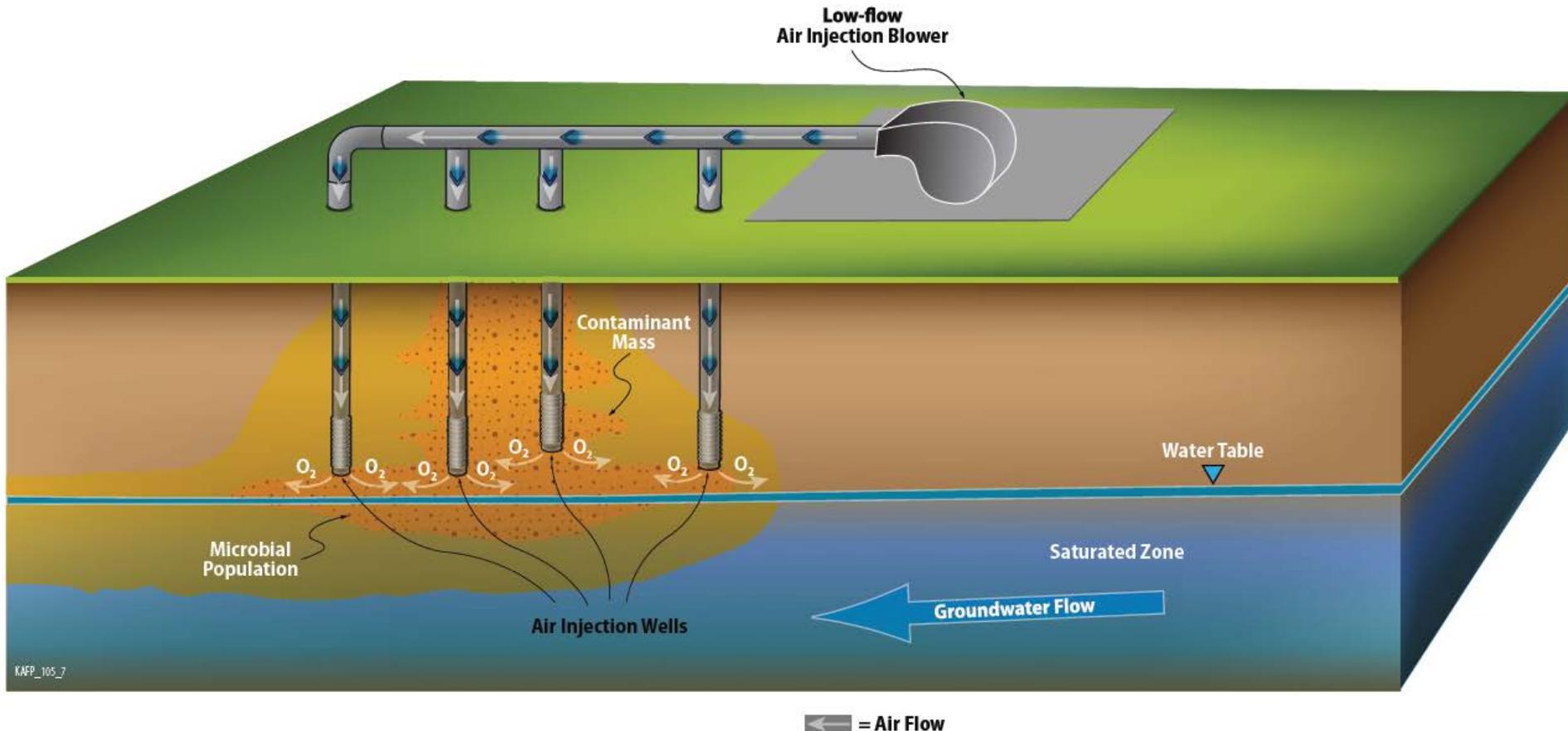
In Situ Respiration Testing

- **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.

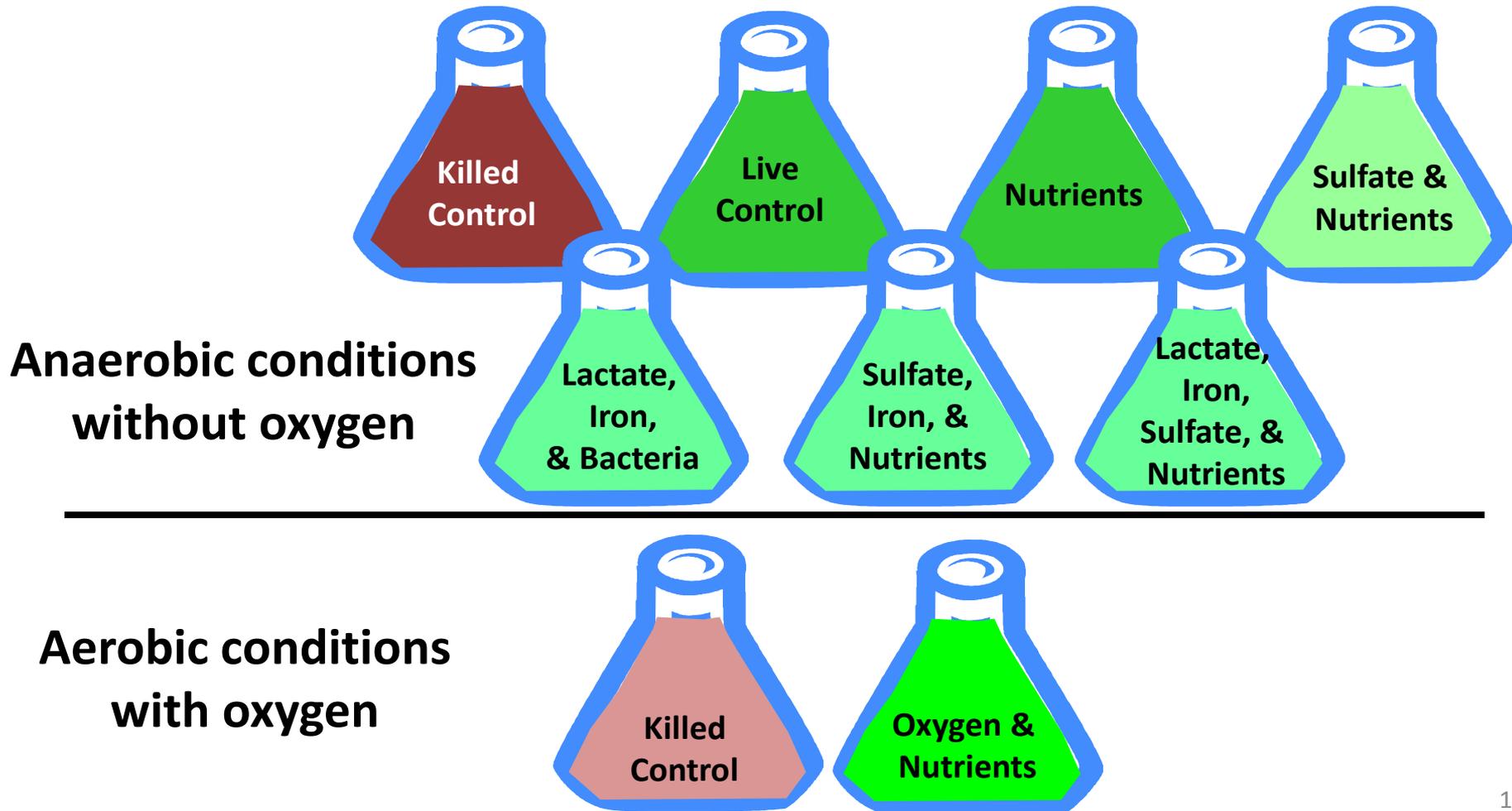
Bio-Venting

- Air is injected into the vadose zone to deliver oxygen to soil bacteria to help them biodegrade contaminants



Laboratory Microcosm Testing

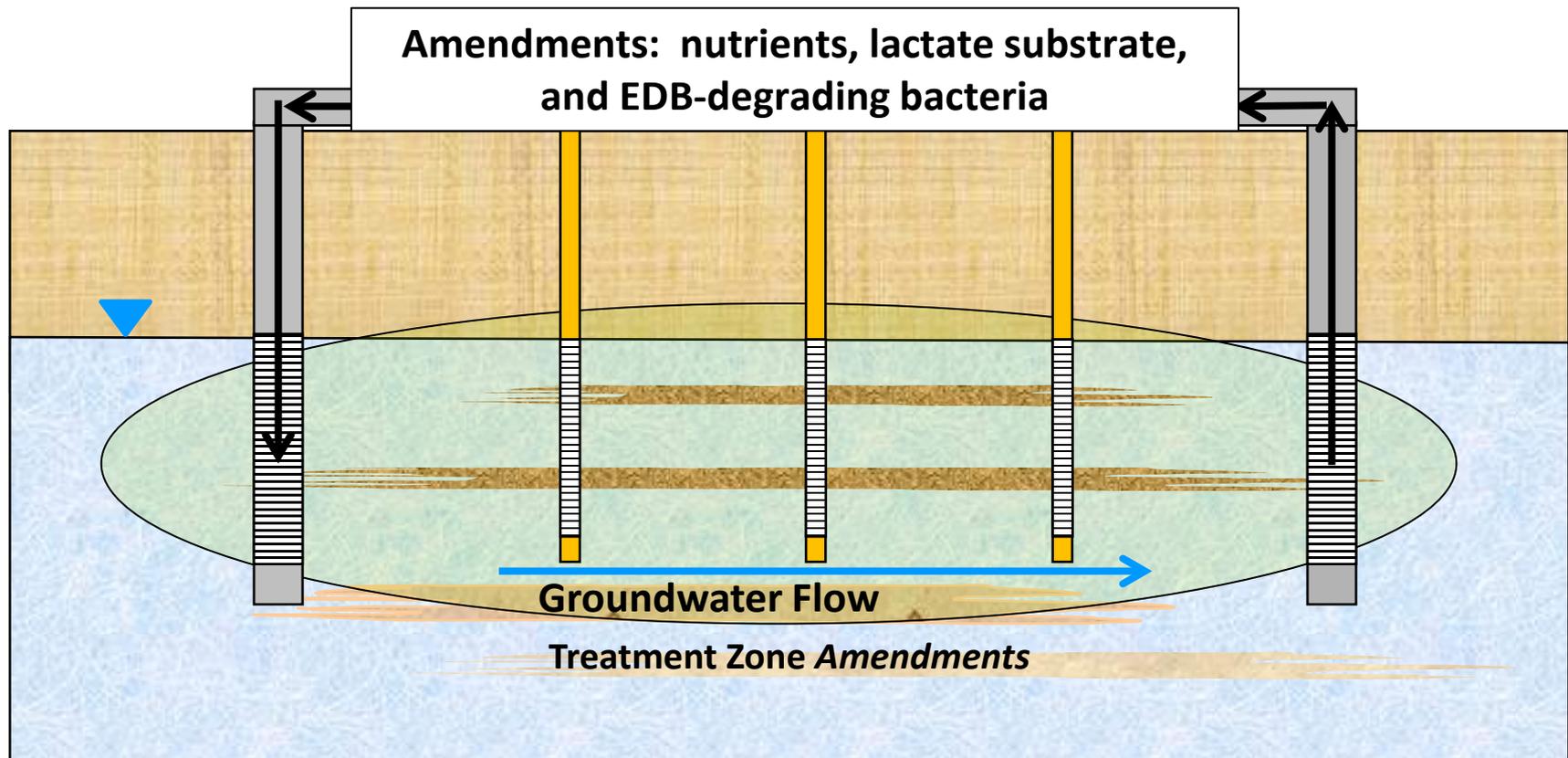
Identify potential technologies to biodegrade EDB



Anaerobic Biodegradation Pilot Test

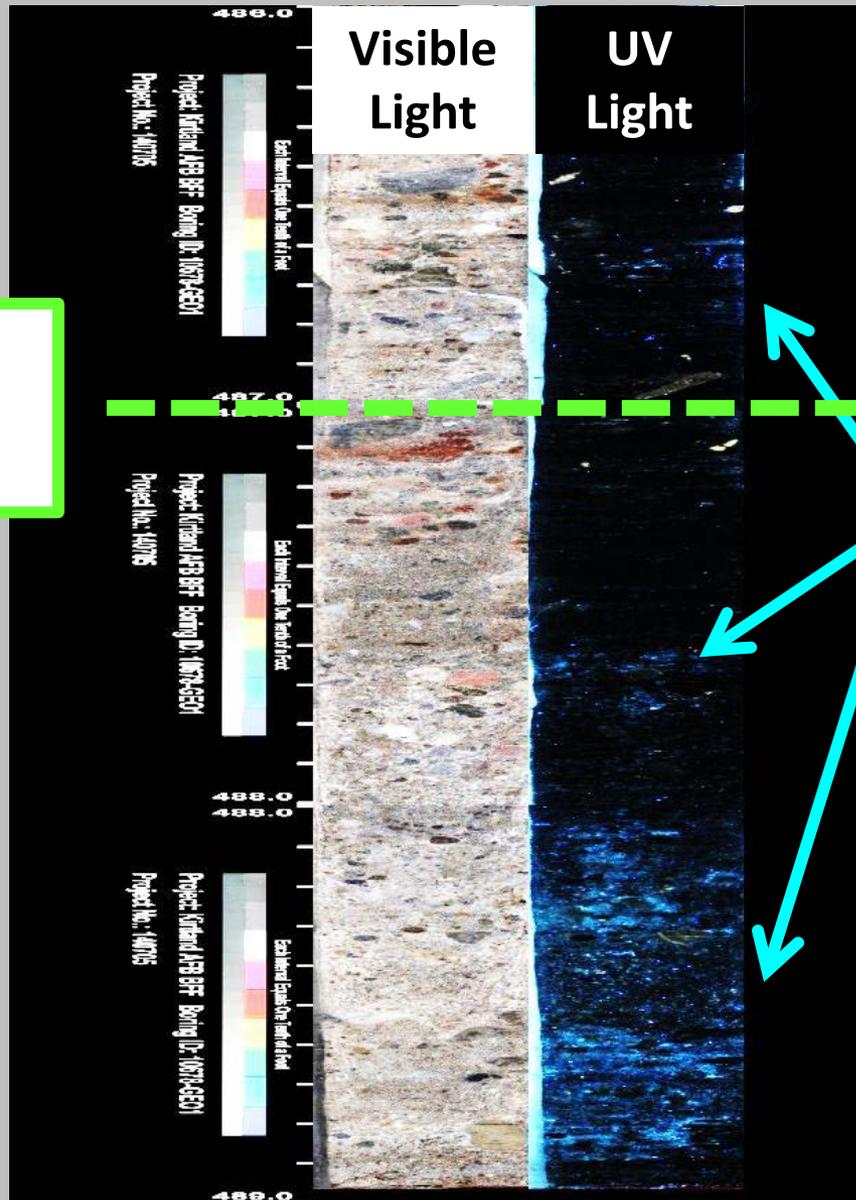
Groundwater Recirculation

- Pump groundwater - Add amendments
- Inject amended water up-gradient to create recirculation cell to support anaerobic biodegradation EDB



Drowned LNAPL – Soil Cores

**Groundwater
Table**



**LNAPL Under
UV Light
Fluoresces
Blue**

LNAPL Clean Up

- **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**
- **Collect continuous core samples from the source area to determine evaluate presence and nature of LNAPL at the site**

2015 Site Status

- **4020 tons of contaminated soil excavated since 2000**
- **287 soil monitoring wells installed since 2000**
- **More than 600,000 gallons of fuel recovered by SVE since 2003; soil vapor levels are decreasing**
- **135 groundwater monitoring wells installed since 2000**
- **Water table continues to rise**
- **Groundwater plumes are relatively stable**
- **Monthly testing of drinking water wells continues to show no evidence of contamination**
- **No contaminant detects in any sentinel wells**
- **First of up to 8 extraction wells to collapse EDB plume began operation in June 2015 with an additional two online by end of the year**

NMED Strategic Plan Summary

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) Clean up soil in the spill area**
- 4) Remediate Light Non-Aqueous Phase Liquid (LNAPL) and associated dissolved phases in the LNAPL area**
- 5) Meet or exceed all requirements for providing public information and involvement**

Thank You Neighborhoods!



The Air Force, NMED, and all the collaborating organizations sincerely thank the neighborhoods for putting up with the temporary road blocks and noise from the well drilling rigs

Upcoming Events

- **Public Field Trip – October 24, 2015 (registration closed)**
- **Public Meeting – November 17, 2015 (no registration required)**



How do I get more information?

Contact NMED:

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Jill Turner,
KAFB project communications lead
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505-222-9548

NMED Website and Listserv: <http://www.nmenv.state.nm.us/>

Contact the Air Force:

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

Air Force BFF-specific spill website: www.kirtlandjetfuelremediation.com

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