

CSSA Regulator Meeting

06/13/2011

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The background of the slide is a faded photograph of a large, two-story building with a red-tiled roof, surrounded by trees and a field. The text is overlaid on this image.

Camp Stanley Storage Activity Status Update

June 13, 2011



INTRODUCTION

Agenda

9:30am Introduction

9:45am SWMU and AOC Updates

- SWMU B-4, AOC-64/SWMU B-71
- Update on Investigations at AOCs and SWMUs
- Geophysical Survey at SWMUs B-27 and B-20/21

11:00am Groundwater

- 3D Mapping
- Downhole Logging
- Groundwater Results
- Well Installations

12:00pm Lunch

1:00pm Treatability Study Updates

- B-3 Treatability Study
- AOC-65 Treatability Study
- Isotope Analysis

2:45pm Miscellaneous

3:00pm Site visit to AOC-65

SWMU & AOC Updates

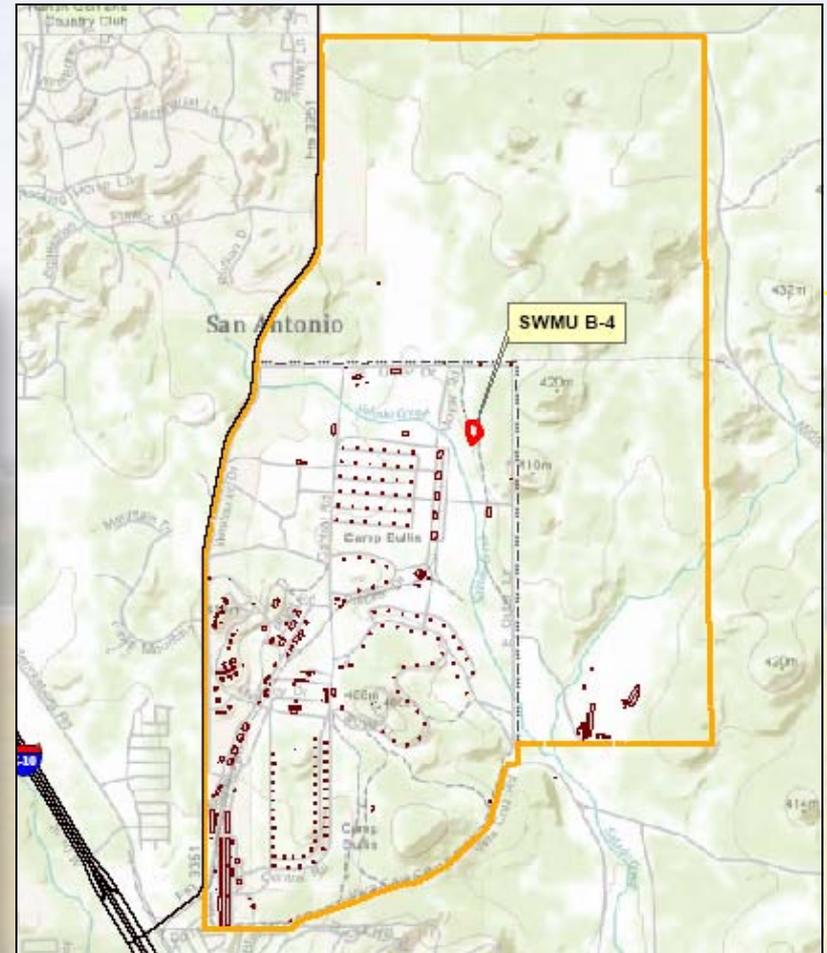
SWMU B-4



SWMU & AOC Updates

SWMU B-4 Background

- Former disposal trenches used to bury classified documents, trash, munitions debris, small arms ammo, and miscellaneous waste.
- Period of use unknown (1982 aerial photo shows site use into 80's).

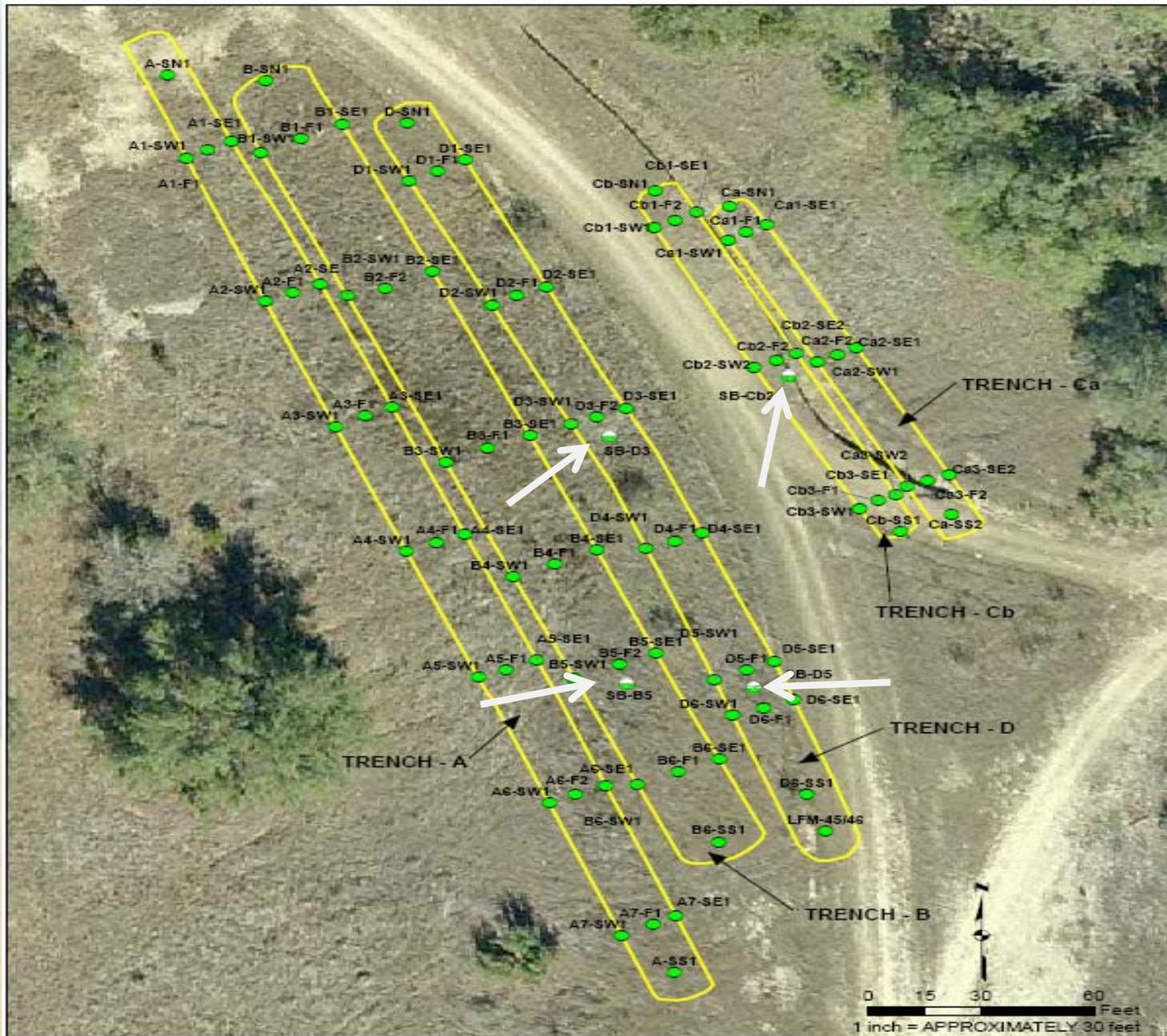


Site area approximately 2 acres

SWMU & AOC Updates

SWMU B-4

- **Excavation of the Four Disposal Trenches Completed**
 - Munitions debris including demilitarized small arms and ammo (SAA), vehicle parts, misc military mission and metal debris, plastic sheeting, etc.
 - Approximately 8,400 CY of debris removed
- **Confirmation Sampling**
 - COC List: Ba, Cd, Cr, Cu, Pb, Hg, Ni, and Zn based on pre-IRA assessment
 - Minimum frequency: one per 50 linear feet of sidewall & floor plus ends
 - Residual COCs less than Tier 1 or Tier 2 RALs - vertically delineated to background or MQL in trenches or in borings below trench floors
 - No groundwater encountered in trenches or borings
- **Waste Disposition**
 - UXO and SAA segregated for CSSA management
 - ~933 CY of metal debris segregated for recycling
 - ~1,000 CY of oversized debris/rock segregated for CSSA management
 - ~280 CY of soil stabilized to non-hazardous criteria
 - Soil and stabilized materials (Class 2 and Class 1 non-hazardous) transported to CSSA East Pasture firing berm



Legend

- Excavation Confirmation sample location with COC concentrations less than Tier 1 and Tier 2 critical PCLs
- Vertical delineation soil boring with COC concentrations less than camp Stanley site specific back ground concentration

Residual COCs in SWMU B-4 Trenches

Target COC	Maximum Residual Concentration (mg/kg)	Detected Average Concentration (mg/kg)	Background (mg/kg)	Critical PCL (mg/kg)	Tier and Pathway
Barium	52.2	17.00	300 ^a	300	Background
Cadmium	4.78	0.255	3.0 ^b	285	Tier 2 ^{GW} Soil _{Ing}
Copper	296	8.79	23.2 ^b	520	Tier 1 ^{GW} Soil _{Ing}
Lead	14.5	4.36	84.5 ^b	84.5	Background
Mercury	2.53	0.124	0.77 ^b	4.6*	Tier 1 ^{Air} Soil _{Inh-V}
				5.3	Tier 2 ^{GW} Soil _{Ing}
Nickel	26.9	5.50	35.5 ^b	79	Tier 1 ^{GW} Soil _{Ing}
Zinc	133	16.09	73.2 ^b	1200	Tier 1 ^{GW} Soil _{Ing}

a - Texas-Specific Background Concentration.

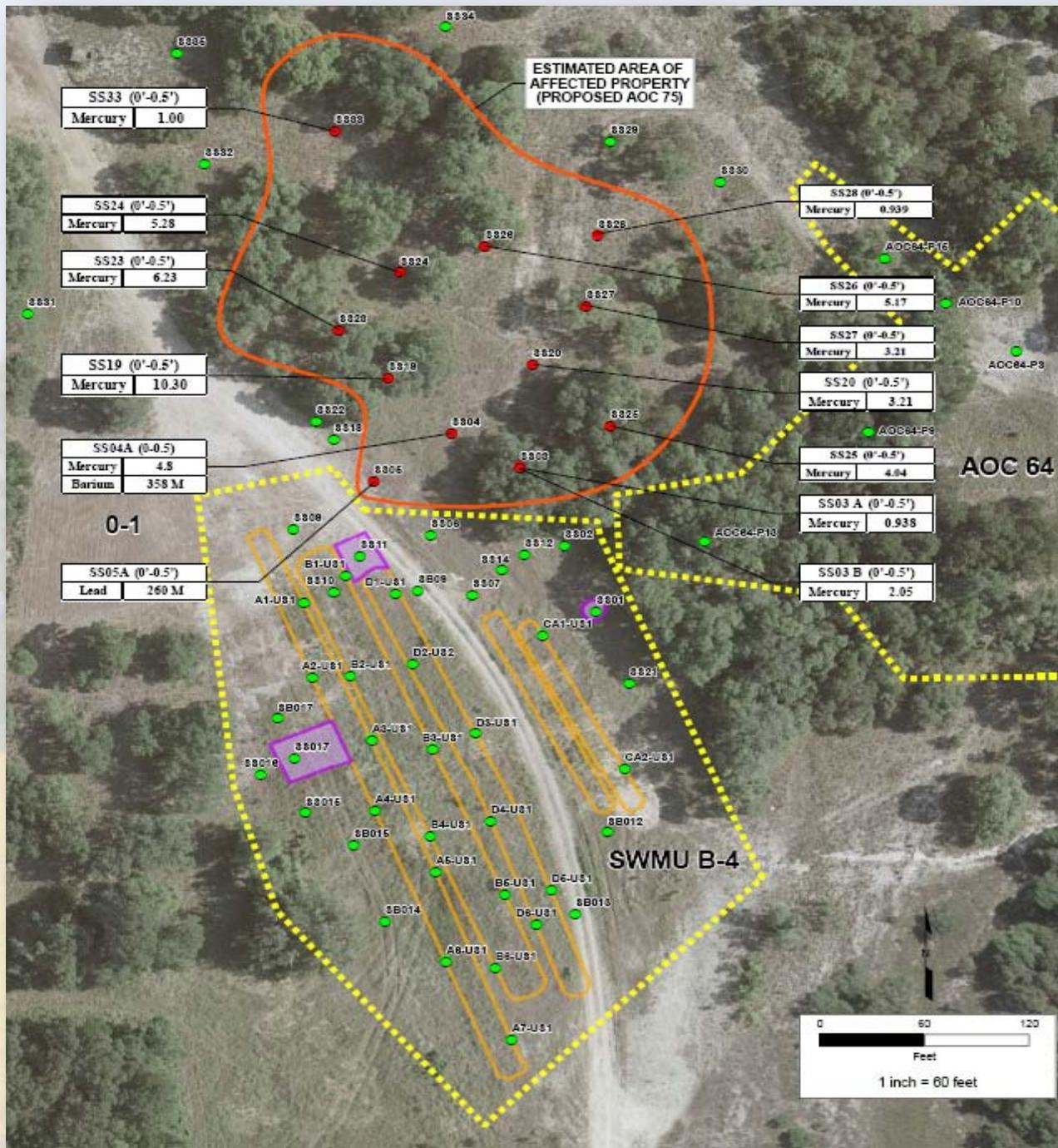
b - CSSA site-specific background concentration.

* - 0.5 acre source area.

SWMU & AOC Updates

SWMU B-4 Removal Action

- Three small areas adjacent to disposal trenches were excavated to 1 foot below grade during IRA to remove spots affected by mercury or barium.
- Metals concentrations in surface soil in trench sidewalls below background
- North-northeast of SWMU B-4 (Proposed AOC-75)
 - Mercury exceeded TRRP RALs and Eco Risk Benchmarks in surficial soil. Barium and lead exceeded Eco Risk at two separate locations
 - Affected surface soil will be addressed by future actions at AOC-75



Residual COCs in Surface Soil at Affected Property (Proposed AOC-75)

Target COC	Maximum Residual Concentration (mg/kg)	Detected Average Concentration (mg/kg)	Background (mg/kg)	Eco-Risk Screening Benchmark (mg/kg)	Critical PCL (mg/kg)	Tier and Pathway
Barium	358	108	300	330	330	ERSB
Cadmium	1.05	0.215	3.0	140	3.0	Background
Copper	16.7	7.26	23.2	61	61	ERSB
Lead	260	54	84.5	120	120	ERSB
Mercury	10.3	3.18	0.77	0.1	0.77	Background
Nickel	14.8	10.57	35.5	30	35.5	Background
Zinc	44.2	18.35	73.2	120	120	ERSB

ERSB – Ecological Risk Screening Benchmark.

Notes: 1. Critical PCL represents the lowest protective level based on background, Tier 1 or 2 human health PCLs, or ERSB.

2. Tier 2 PCLs for soil to groundwater leaching-ingestion pathway developed for barium, lead, and mercury.

SWMU & AOC Updates

SWMU B-4 SUMMARY

- Affected soil and debris in SWMU B-4 disposal trenches removed
- Residual COCs at excavation limits are < Residential Tier 1 or Tier 2 PCLs and Eco Risk Benchmarks and have been delineated vertically to background
- No further remedial action required for trenches
- APAR submitted to TCEQ in August 2011
- Surface soil in area north-northeast of SWMU B-4 (proposed AOC-75) impacted primarily by mercury exceeding residential human health PCLs (Tier 1 $\text{Total Soil}_{\text{Comb}}$ and Tier 2 $\text{GW Soil}_{\text{ing}}$) and Eco Risk Screening Benchmarks
- AOC-75 proposed to accomplish assessment and remedial actions for surface soil

SWMU & AOC Updates

AOC-63 & AOC-64/SWMU B-71

AOC 63

- TCEQ conditional approval for no further action (NFA) dependent on review of ecological risk assessment issues.
- Status of review?

AOC 64/SWMU B-71 IRAs

- Sidewall and floor samples analyzed for VOCs, SVOCs, metals and explosives.
- All COCs above Tier 2 PCLs removed, only barium and mercury remain above ecological risk screening benchmark values at AOC-64.
- Follow-up ecological risk confirmation sampling in February and April 2011: all remaining COCs are below ecological risk benchmark screening values at 0-0.5 ft with 2 exceptions at AOC 64 (represents less than 3% of samples 0-0.5 feet bgs for mercury and barium).
- Vertical delineation of inorganic COCs to background at both sites.
- N-Nitrosodiphenylamine below reporting limit (RL) in 2 of 4 floor samples at SWMU B-71.
 - Observed concentrations of 0.0132J and 0.0191J mg/kg (Tier 1 cPCL 1.4 mg/kg)
- Follow-up sampling February 2011: benzene delineated vertically at AOC 64.
- APAR:
 - NFA based on post-removal conditions
 - To be submitted for TCEQ review July 2011

SWMU & AOC Updates

Site Closure Status

Remaining Open Sites: 25

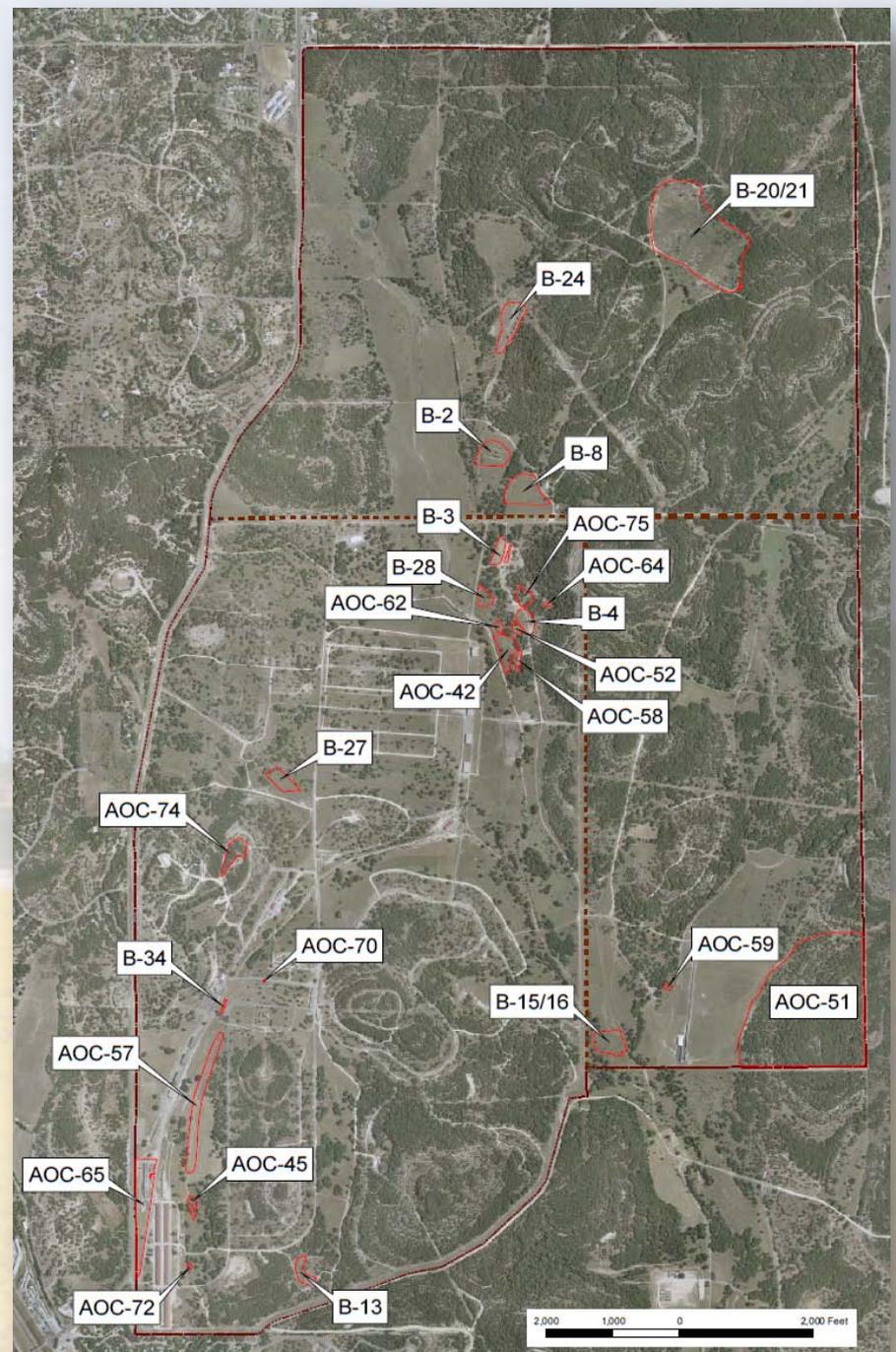
SWMUs

B-2
 B-3
 B-4
 B-8
 B-13
 B-15/16
 B-20/21
 B-24
 B-27
 B-28
 B-34

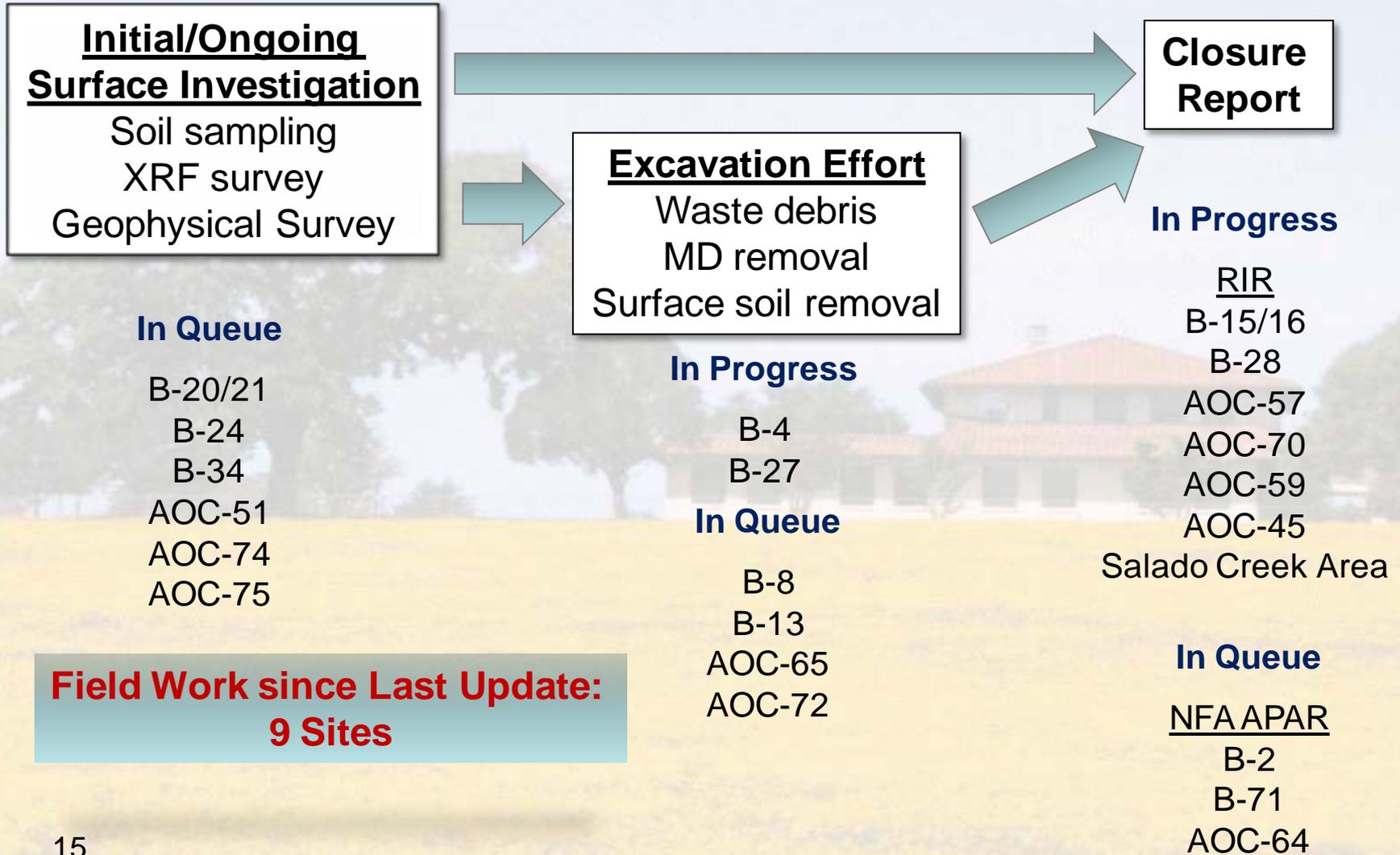
AOCs

AOC-42
 AOC-45
 AOC-51
 AOC-52
 AOC-57
 AOC-58
 AOC-59
 AOC-62
 AOC-64
 AOC-65
 AOC-70
 AOC-72
 AOC-74*
 AOC-75*

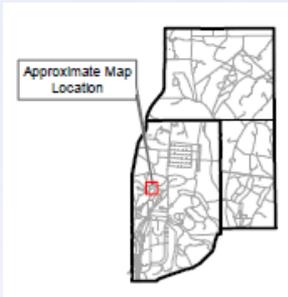
*New sites in 2011.



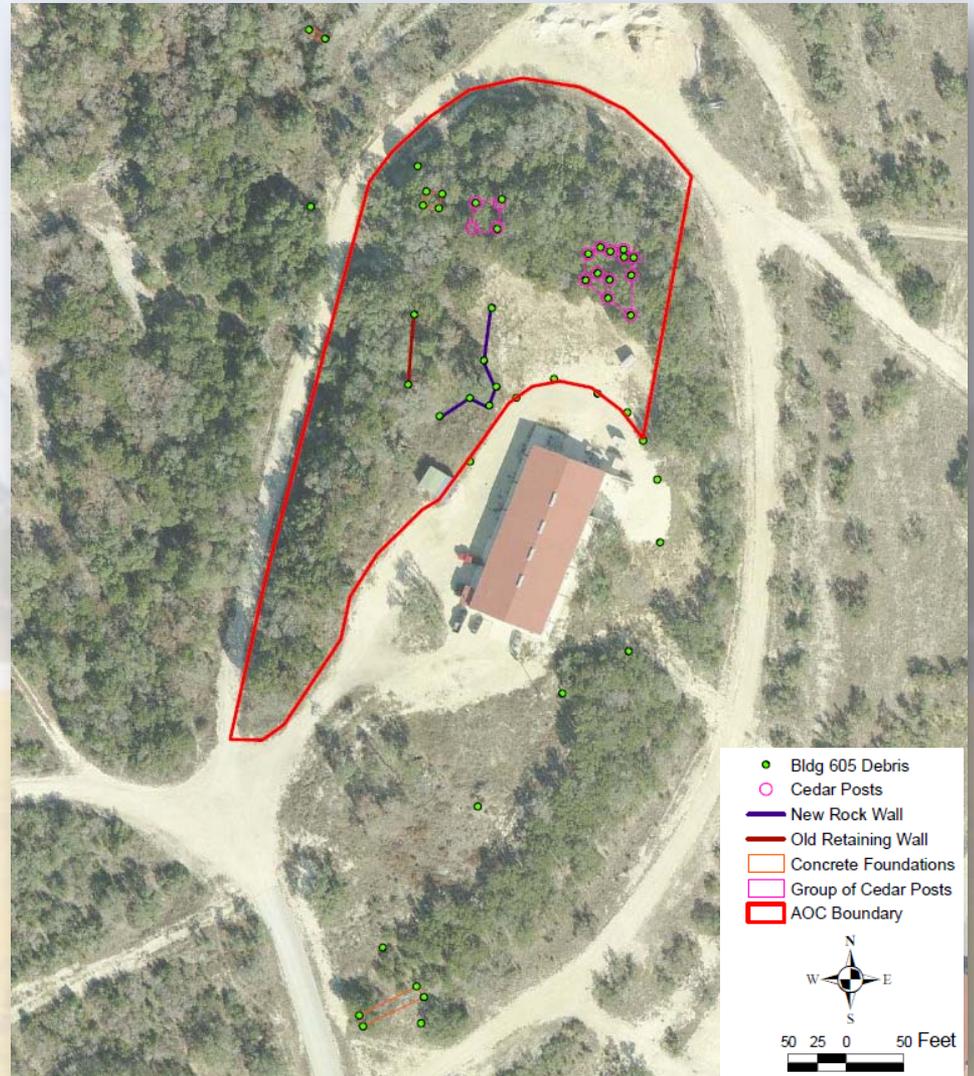
Current Status



New Site AOC-74



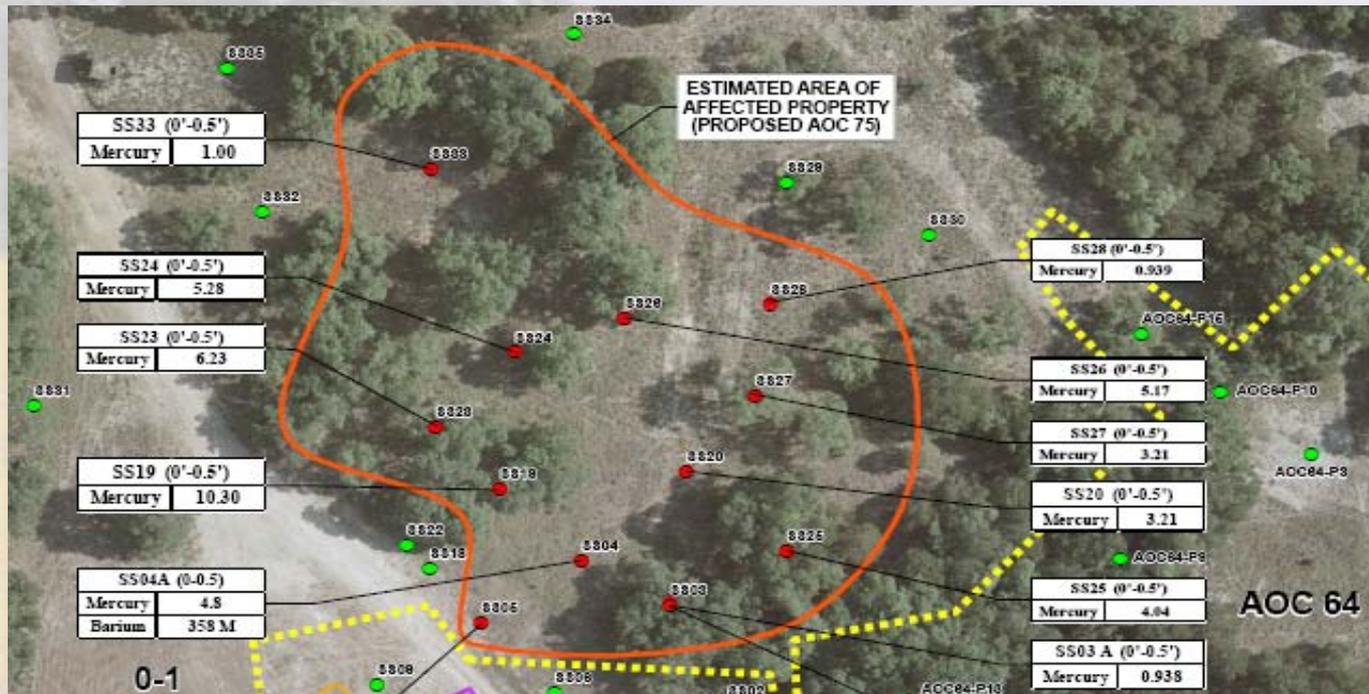
- Surficial debris, 2.3 acres
- Work Performed: none.
- Next Steps:
 - XRF survey, possible surface soil sampling
 - Debris removal and excavation of contaminated soil (>Tier 1 PCLs) if necessary
 - RIR and closure

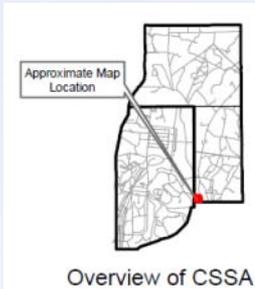


New Site AOC-75



- Disposal area, ~2 acres
- Work Performed: surface soil sampling.
- COCs are mercury, barium, and lead.
- Next Steps:
 - Additional surface soil sampling to delineate contamination.
 - Excavation of surface soils.
 - Submit RIR or APAR to TCEQ requesting NFA decision.

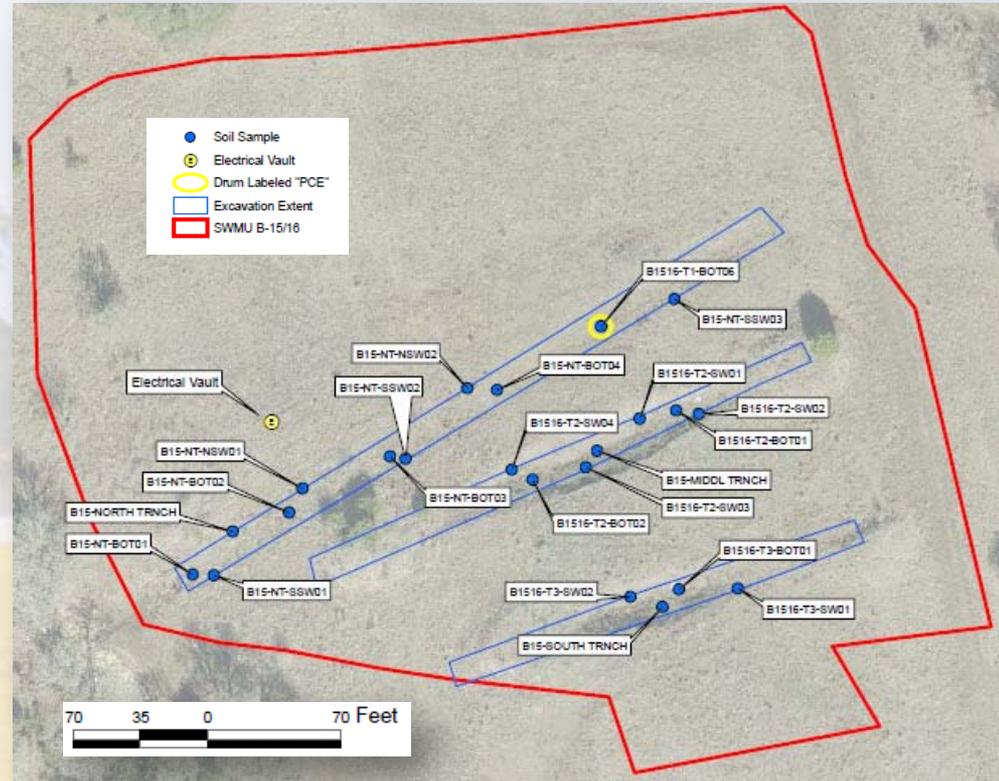


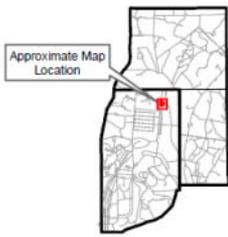


Closure Report in Progress

SWMU B-15/16

- Landfill area, 3.5 acres
- Previous work: geophysical surveys, soil gas survey, and surface soil sampling.
- Work performed: 3 trenches excavated, removal of ~4,000 cubic yards (CY) of material:
 - 400 CY metal debris recycled
 - 80 CY of styrofoam to landfill
 - 160 CY of Class 2 non-hazardous soil to landfill
 - 3,360 CY of non-impacted soil used as backfill
- Contaminants of concern (COCs) were barium, chromium, copper, and zinc.
- Investigation completed March 2011; results met “Not subject to TRRP” criteria:
 - All COCs below Tier 1 residential soil PCLs
- Release Investigation Report (RIR) completed May 2011; submitted to TCEQ June 6, 2011.
- No Further Action (NFA) decision requested from TCEQ.



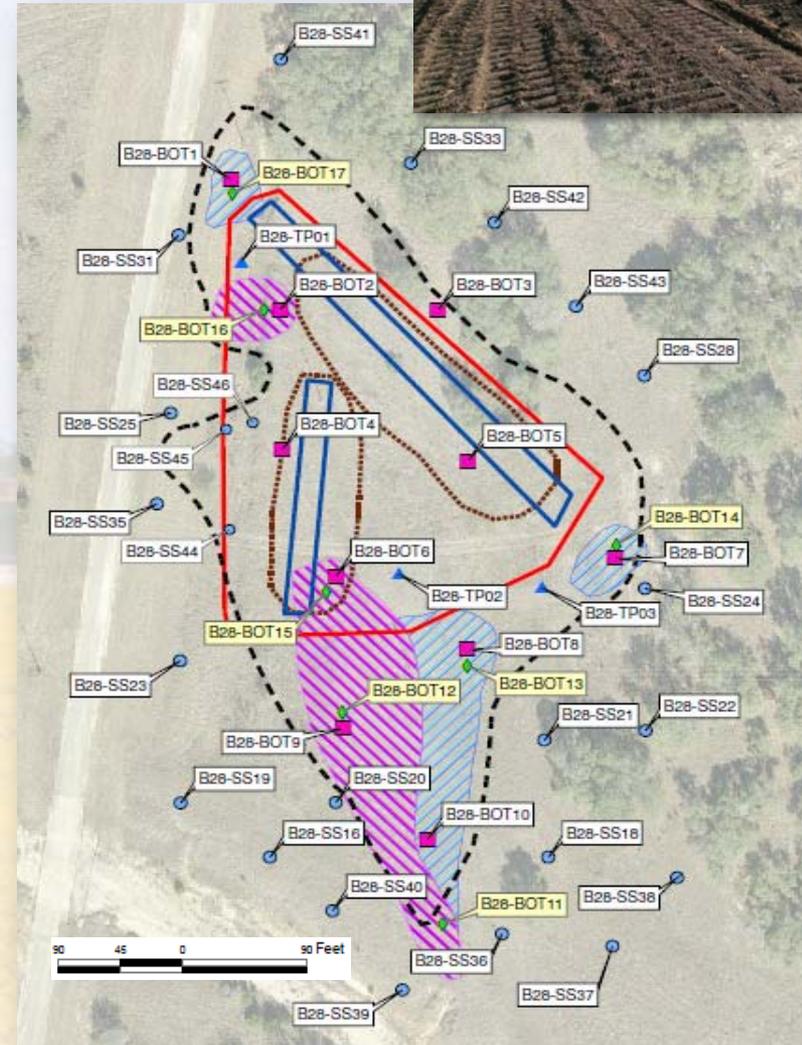


Overview of CSSA

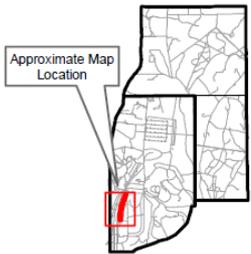
Closure Report in Progress SWMU B-28



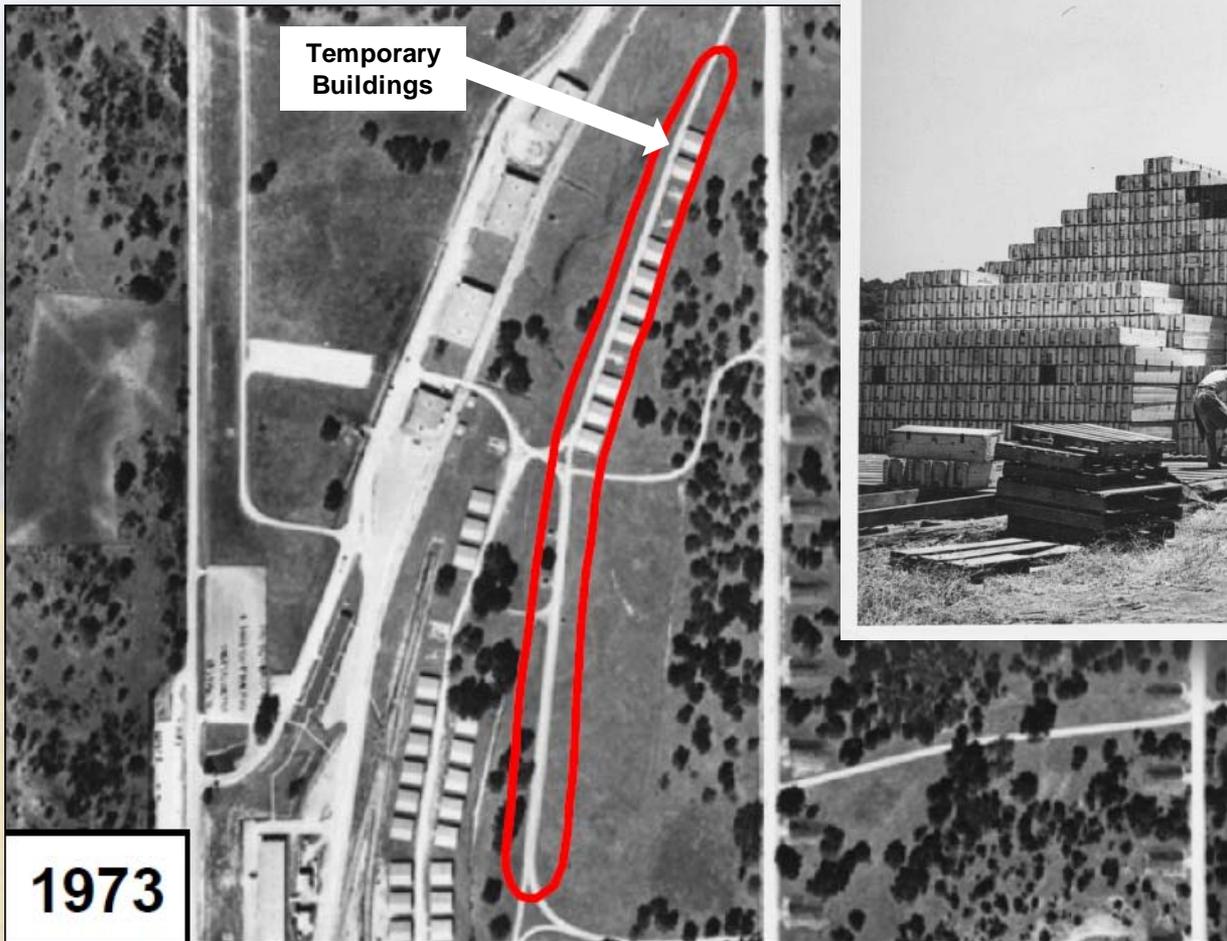
- Disposal area, 1.4 acres
- Previous work: geophysical survey, soil borings, groundwater sample, soil gas survey, and surface soil sampling.
- Work performed: XRF survey, surface soil sampling, excavation of ~6,200 CY of soil material:
 - 1,300 CY of material from 1997 effort
 - 4,900 CY of nonhazardous soils, used at East Pasture berm
 - 1,400 lbs of metal debris recycled
- COCs were barium, copper, and zinc.
- Investigation completed March 2011; results met the “Not subject to TRRP” criteria:
 - COCs below Tier 1 residential soil PCLs except for barium. Calculated 95% UCL for barium.
- RIR currently in review.
- Expect to request NFA decision from TCEQ in June.



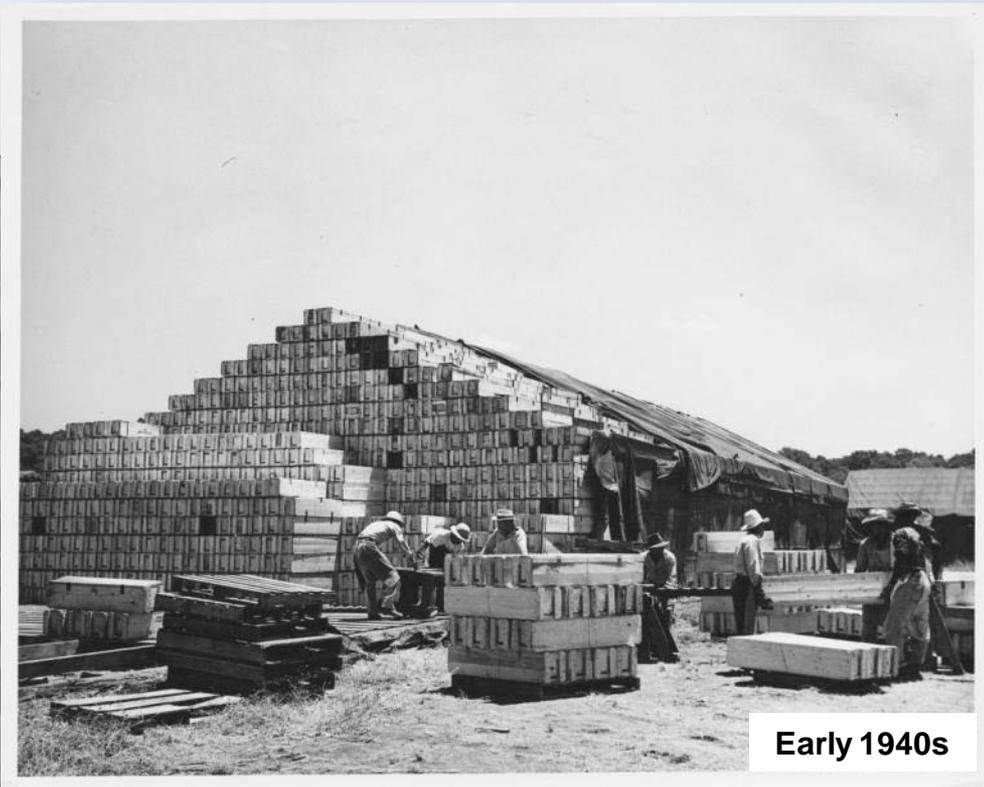
Closure Report in Progress AOC-57



Overview of CSSA

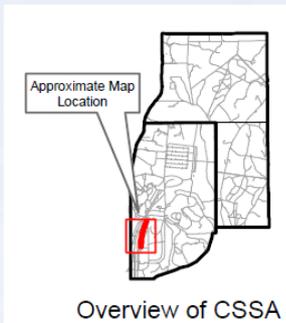


1973

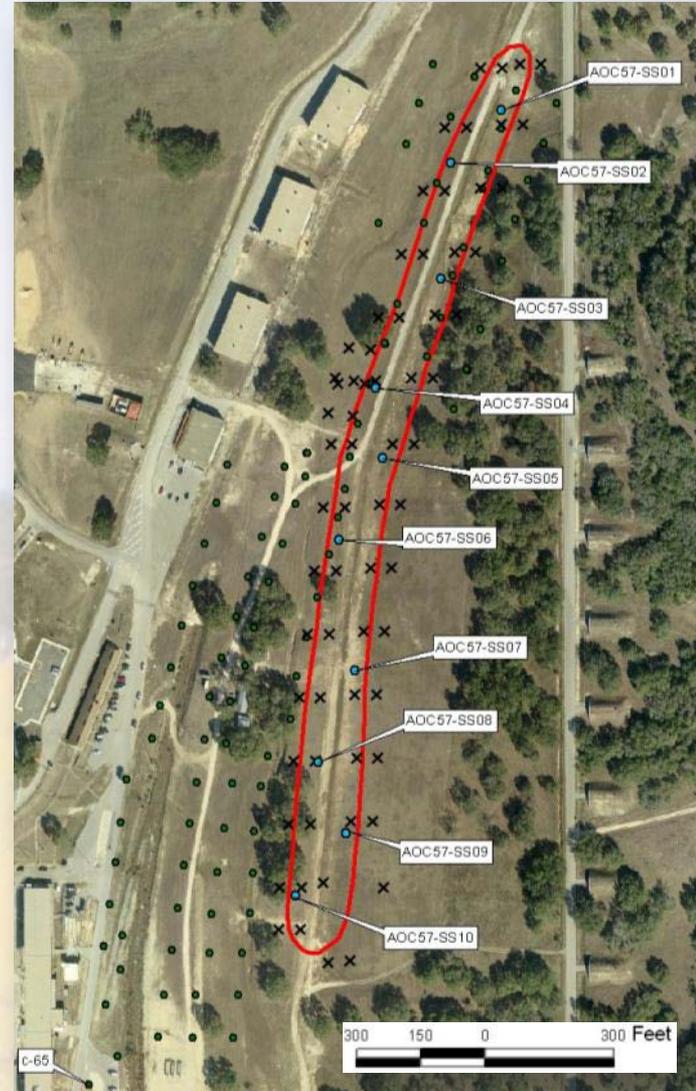


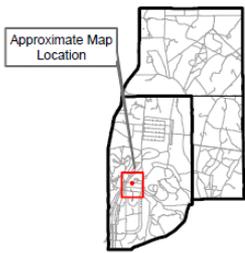
Early 1940s

Closure Report in Progress AOC-57



- Area used for storage in temporary buildings, 6 acres
- Previous work: soil gas survey.
- Work performed: surface soil sampling.
- No COCs detected above Tier 1 residential soil PCLs.
- Investigation completed February 2011; results met the “Not subject to TRRP” criteria.
- RIR currently in review at CSSA.
- Expect to request NFA decision from the TCEQ in June.



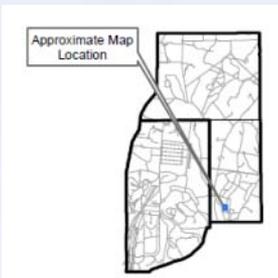


Overview of CSSA

Closure Report in Progress AOC-70

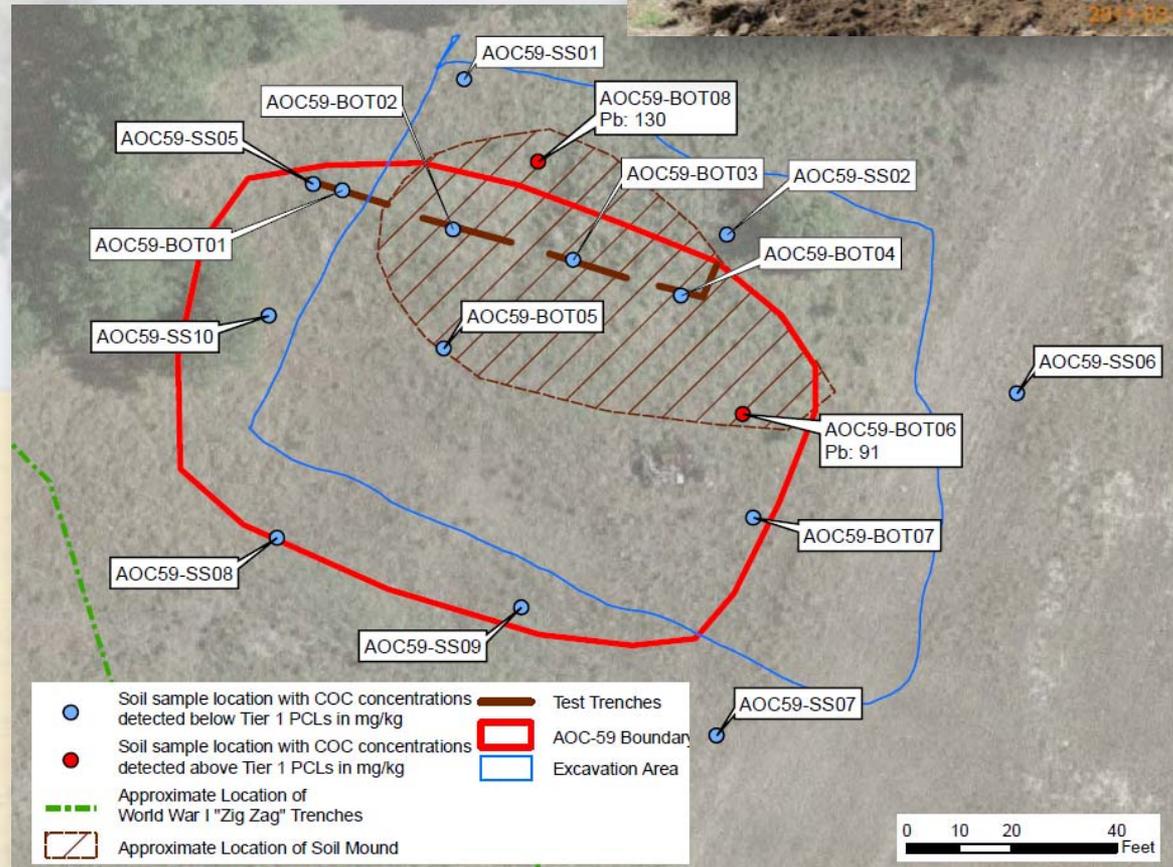
- Former pesticide storage building, 80 ft² in area
- Previous work: building remodeled in 2006, rinsate water sample collected.
- Work Performed: surface soil sampling.
- No COCs detected above Tier 1 residential soils PCLs.
- Investigation completed February 2011; Investigation results met the “Not subject to TRRP” criteria.
- RIR completed May 2011; submitted to TCEQ June 7, 2011.
- No Further Action (NFA) decision requested from TCEQ.





Closure Report in Progress AOC-59

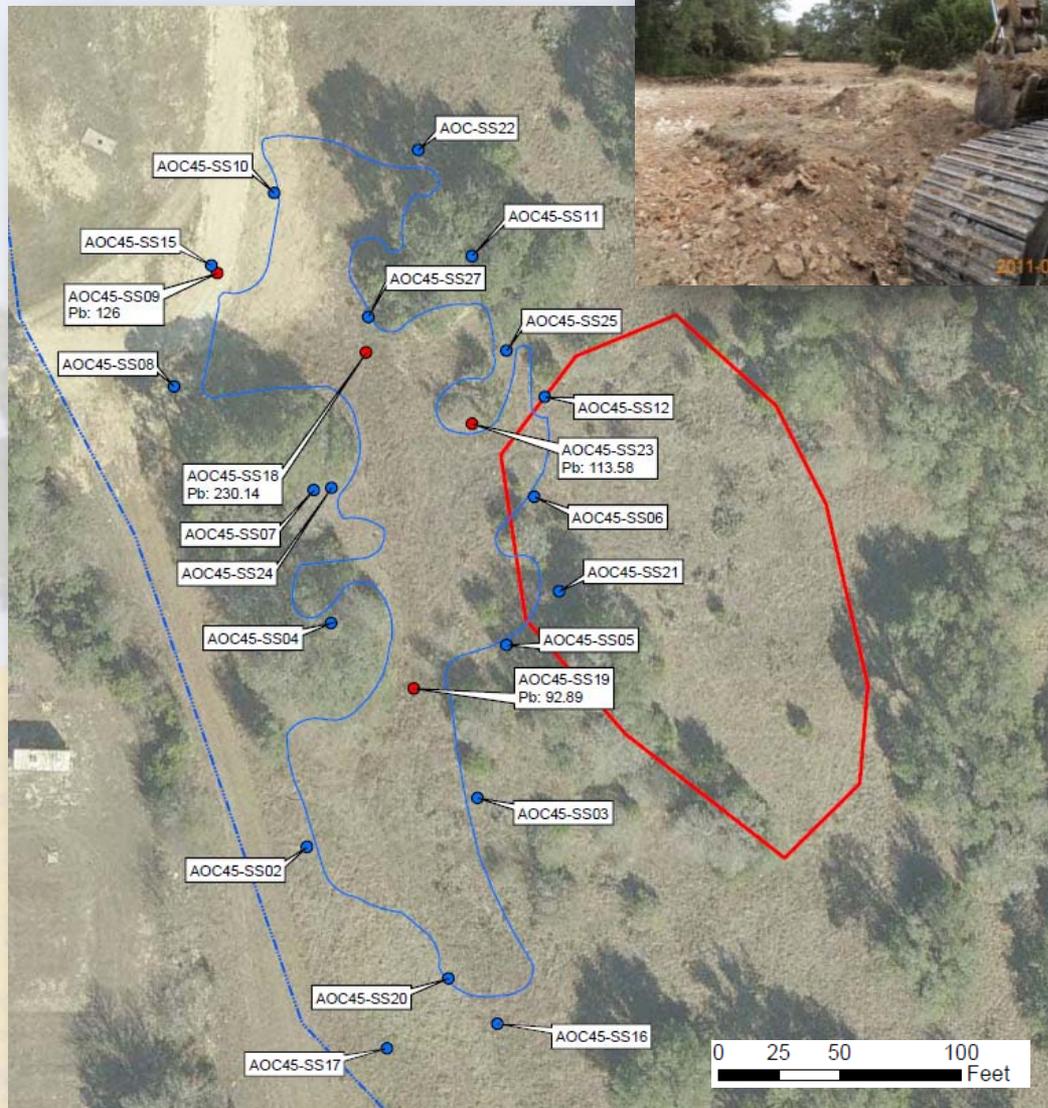
- Soil mound, 0.2 acres
- Previous work: geophysical survey, exploratory excavations, and subsurface soil sampling.
- Work performed: surface soil sampling and excavation of ~1,200 CY of soils:
 - All soils were nonhazardous, used at East Pasture berm.
- COC was lead.
- Investigation completed April 2011; results met the “Not subject to TRRP” criteria:
 - Calculated 95% UCL for lead.
- RIR currently in review.
- Expect to request NFA decision from TCEQ in June.



Closure Report in Progress AOC-45



- Ammunition disposal area, ~0.5 acres
- Previous work: none.
- Work Performed: XRF survey, surface soil sampling, and excavation of ~1,700 CY soil:
 - All soils were nonhazardous, used at East Pasture berm.
- COCs were lead and explosives.
- Investigation completed May 2011; results met the “Not subject to TRRP” criteria:
 - Calculated 95% UCL for lead.
- Next Steps:
 - CSSA to contract watershed/drainage plan for Inner Cantonment Area; possible site for retention ponds.





Closure Report in Progress

Salado Creek Area

- Four identified trench areas within a 6.9-acre (total) area:
 - AOC-42 (2.5 acres)
 - AOC-52 (0.46 acre)
 - AOC-58 (0.39 acre)
 - AOC-62 (0.42 acre)
- Previous work: geophysical surveys, surface and subsurface soil sampling, soil gas surveys, and exploratory excavations.
- Work Performed: excavation of debris and soil materials, ~ 7,600 CY of material removed:
 - 5,300 CY of soil was nonhazardous, used at East Pasture berm (2,600 CY non-impacted, reused on site)
 - 2,300 CY of metal debris
 - 62 CY of fibrous glass (AOC-42)
 - 500 CY of medical debris (AOC-52)





Closure Report in Progress

Salado Creek Area

- COCs included mercury, cadmium, copper, lead, and zinc.
- Excavation completed May 2011; results met the “Not subject to TRRP” criteria:
 - All COCs below Tier 1 residential soil PCLs
- Next Steps:
 - Complete sorting operation
 - Perform confirmation geophysical survey
 - Salado Creek RIR currently in progress
 - Expect to request NFA decision from TCEQ

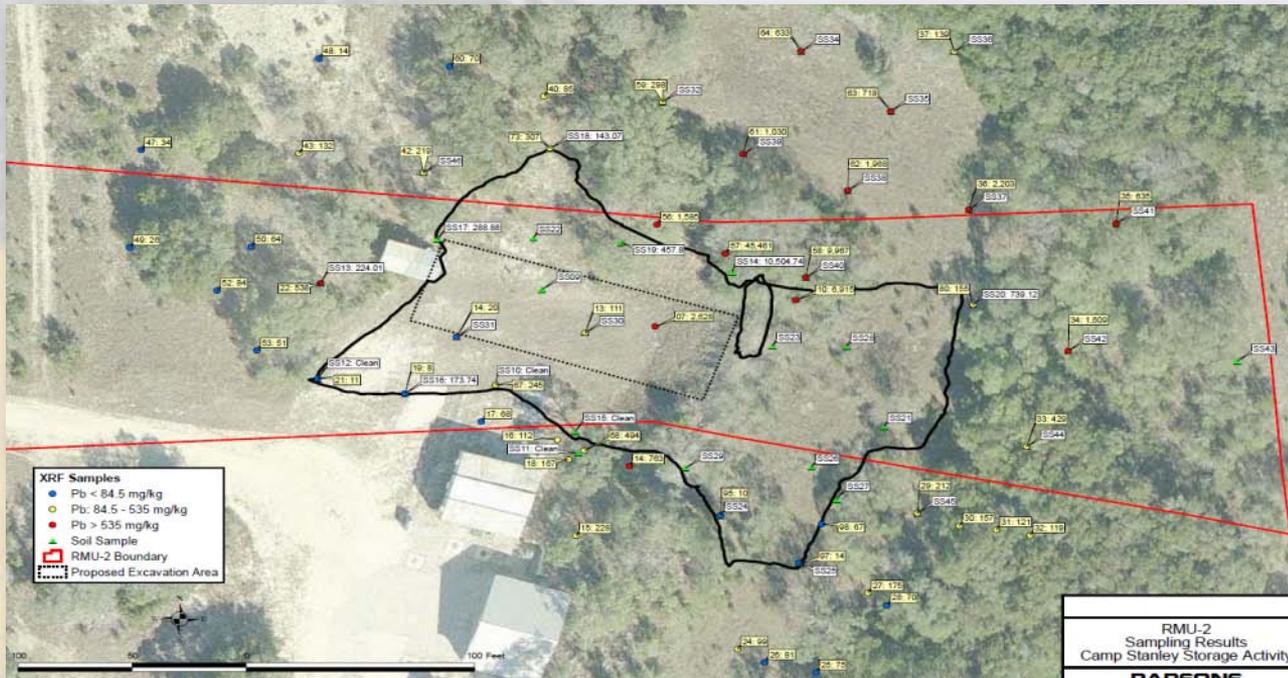




Excavation Effort – In Progress

RMU-2

- Rifle range, 3.1 acres
- Previous work: none.
- Work performed: XRF survey, excavation in progress.
- COCs are lead, cadmium, zinc, copper, and explosives Tetryl and DNT.
- Next Steps
 - Complete excavation
 - Submit RIR or APAR to TCEQ requesting NFA decision



Excavation Effort – In Progress SWMU B-27



- Reportedly former sanitary landfill, 2 acres
- Previous work: geophysical survey, surface and subsurface soil sampling, and exploratory trenching.
- Excavation to begin June 13 or 14th.
- Next Steps:
 - Complete excavation
 - Submit RIR to TCEQ requesting NFA decision



Site Closure Work in Queue

Initial/Ongoing Surface Investigations

- B-24: USGS All Tem
- B-34: XRF survey west of site, surface soil sampling
- AOC-51: Field map, possible geophysical survey
- AOC-74: XRF survey
- AOC-75: Additional surface soil sampling

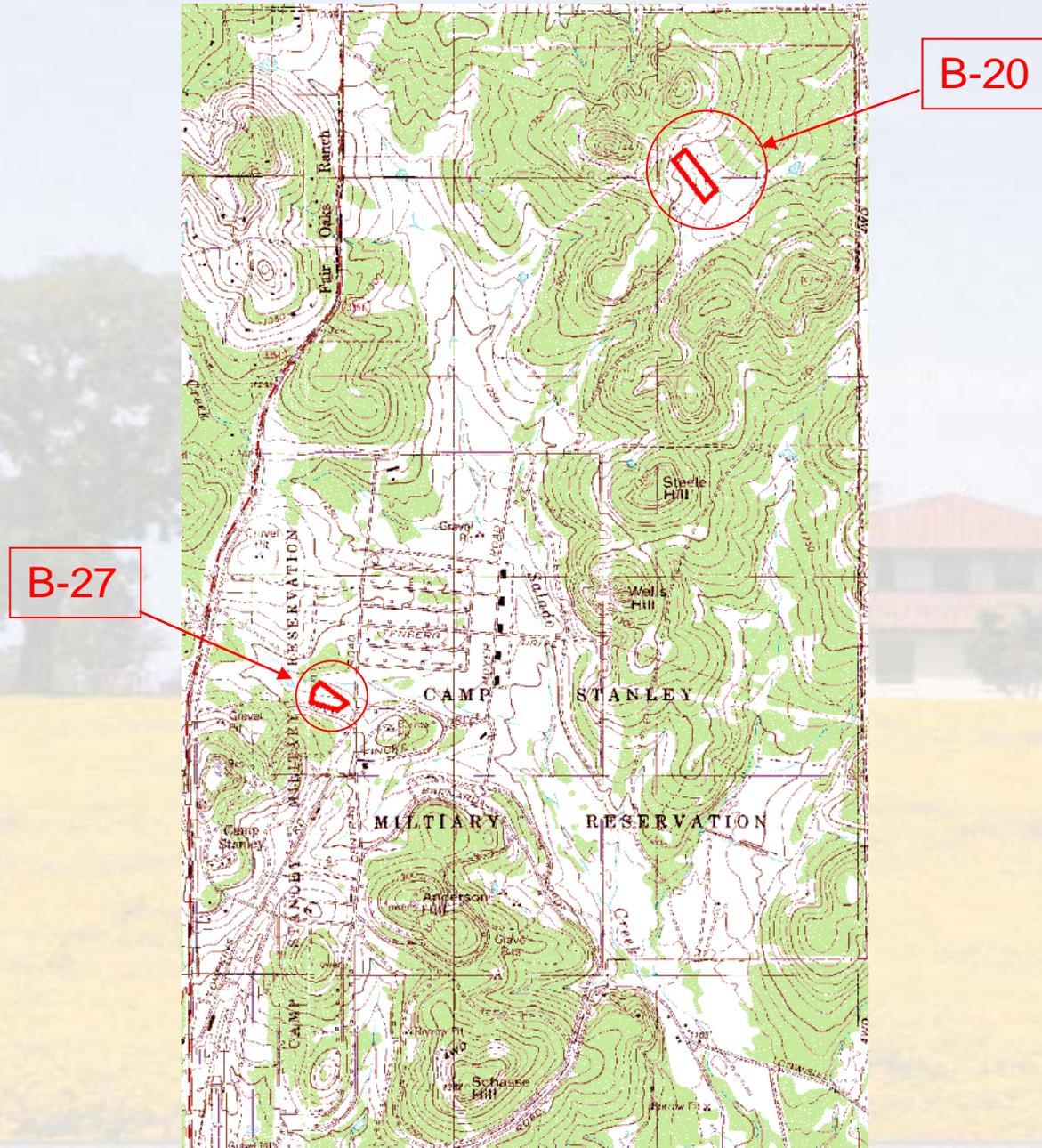
Excavation Efforts (subject to budget availability)

- B-8: Surface soil removal
- B-13: Waste debris removal
- B-20/21: Removal of MC contaminated surface soils
- AOC-72: Waste debris removal

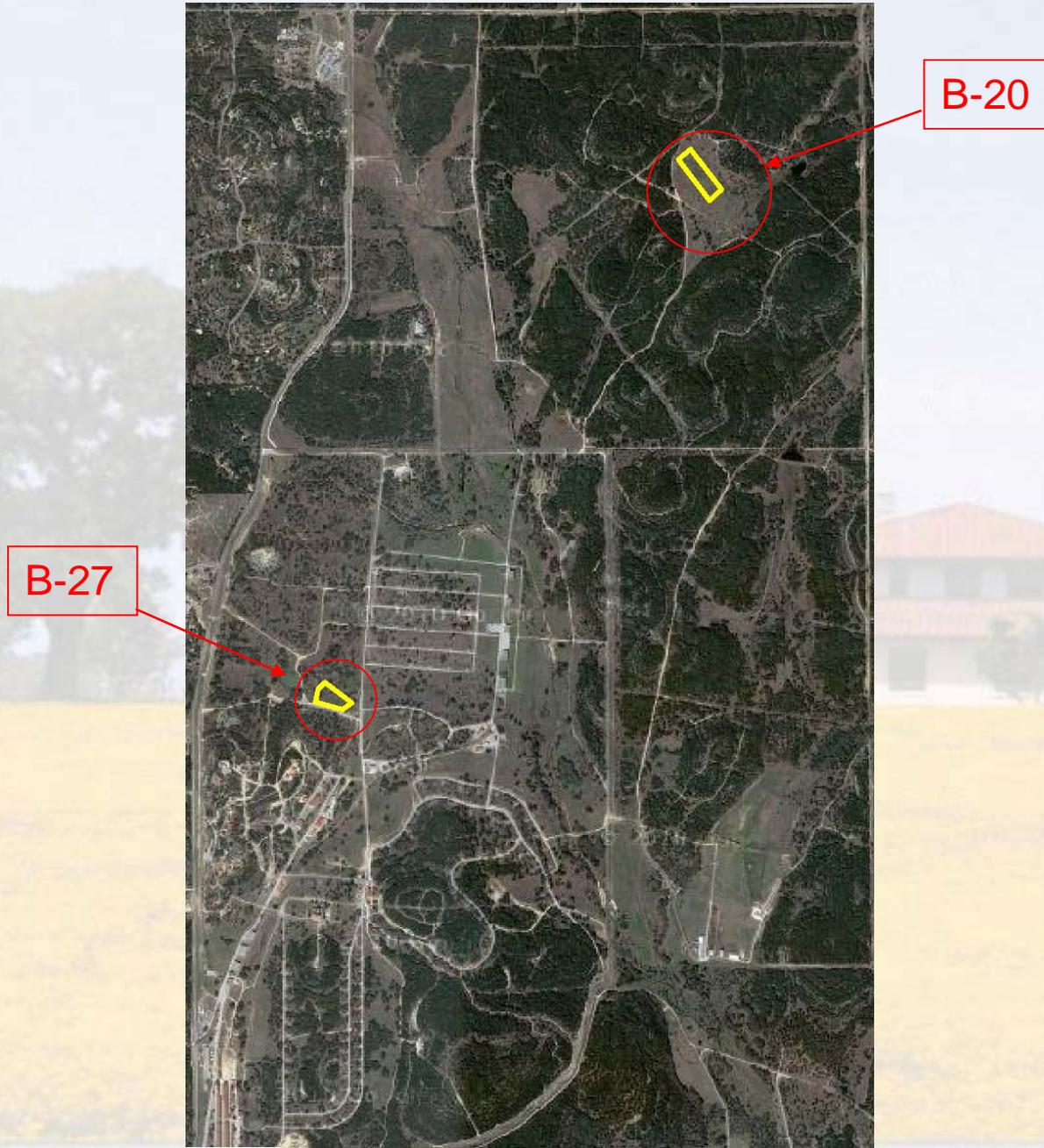
Geophysical Surveys at CSSA

1. Demonstration test of ALLTEM for target location
 - B-20/21 OB/OD area
 - B-27 trench area
2. Estimate trench volumes using dc resistivity
 - B-27
3. Current and planned activities

Surveyed Areas (Feb. 2011)



Survey Areas (Feb. 2011)



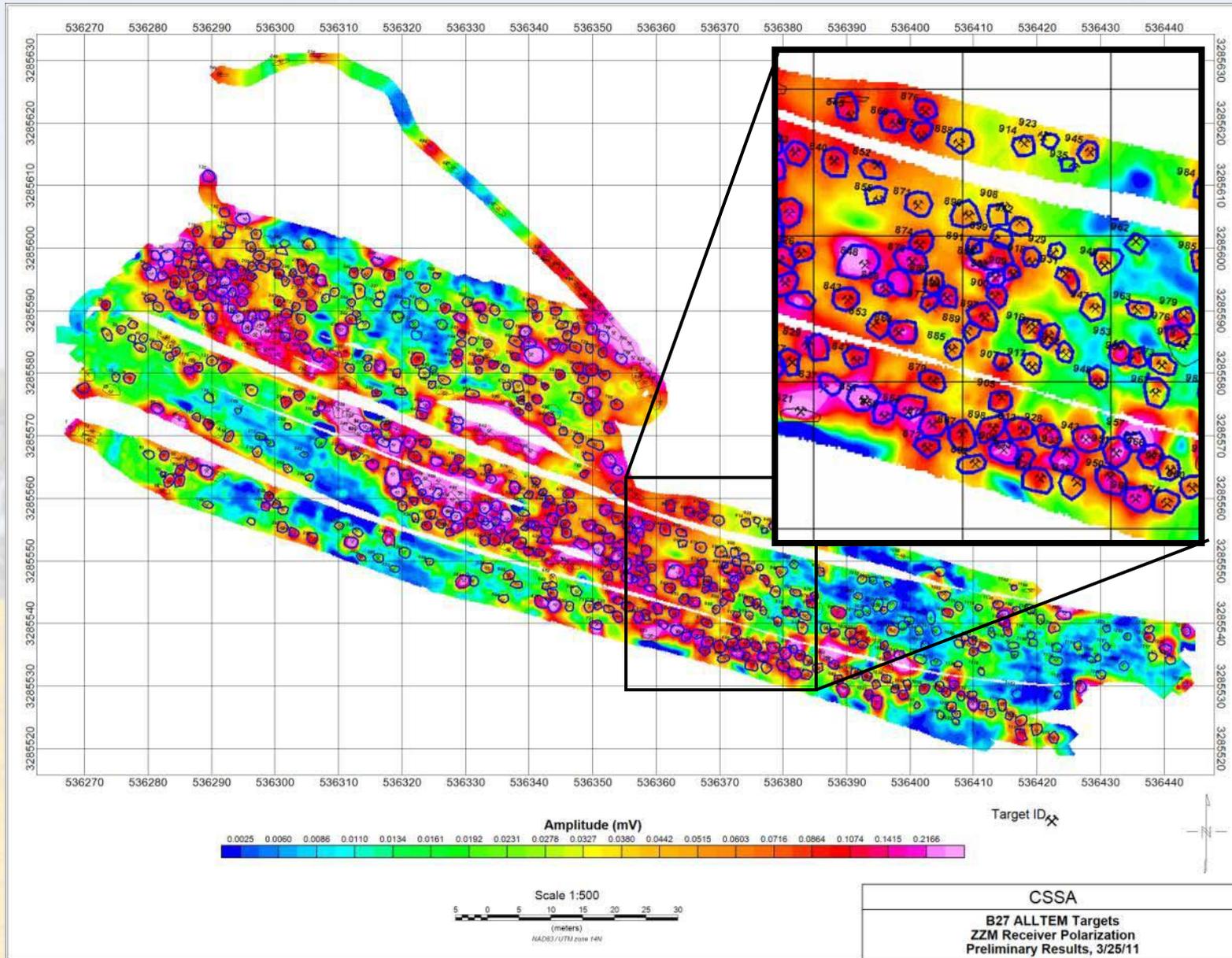
B-27 Geophysical Surveys



EXPLANATION

- Red polygon = planned ALLTEM survey area
- Irregular blue line = actual ALLTEM area surveyed
- Orange lines = GEM2 survey
- Thick black lines = Earth Resistivity (dc) transects (numbered in green)

ALLTEM Target Map B-27



The automatic target picker draws a polygon around individual targets, marks the peak, and assigns a target number to each.

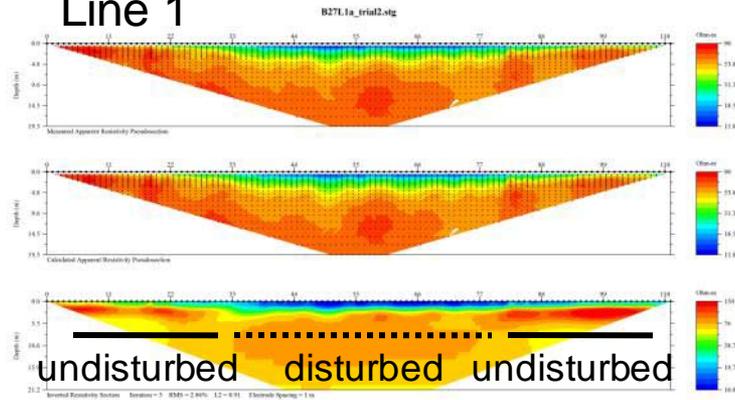
Each target will be processed using the inversion program, which estimates target characteristics and generates a dig list.

This is a target map using the ZM polarization, akin to an EM61 configuration.

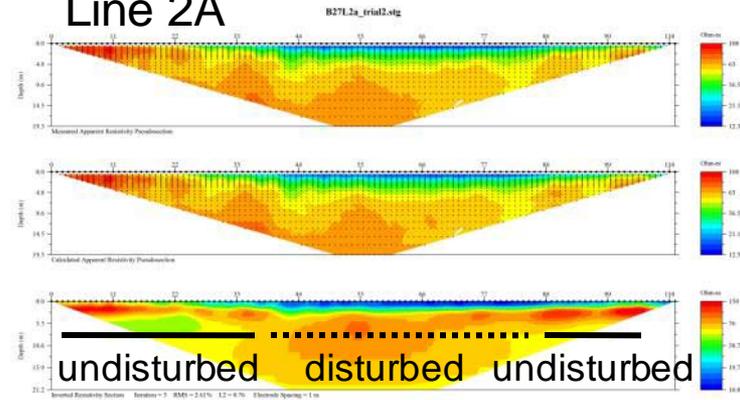
This is just 1 of 19 polarization maps.

Earth Resistivity Imaging B-27

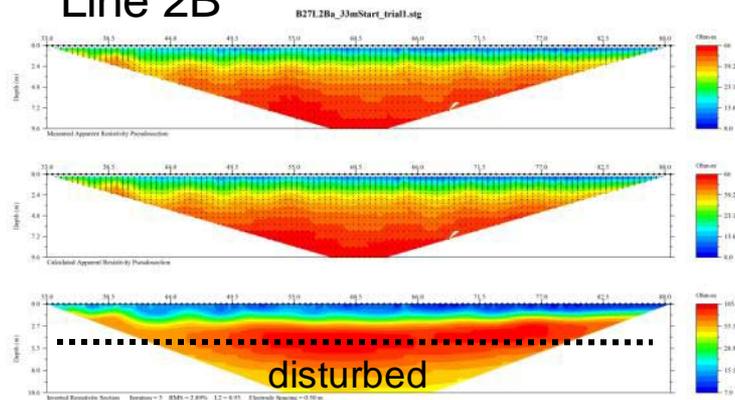
Line 1



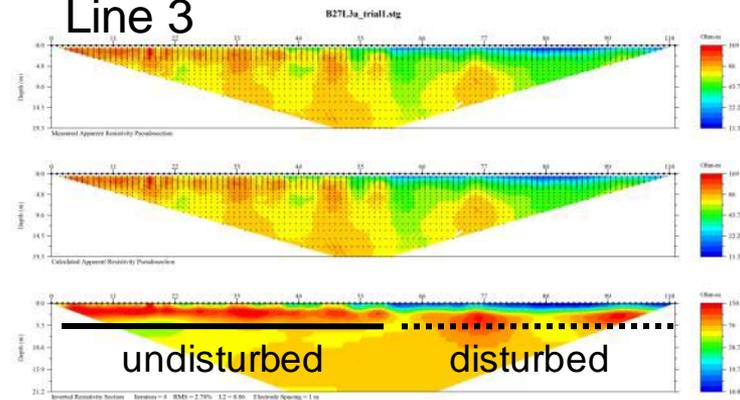
Line 2A



Line 2B

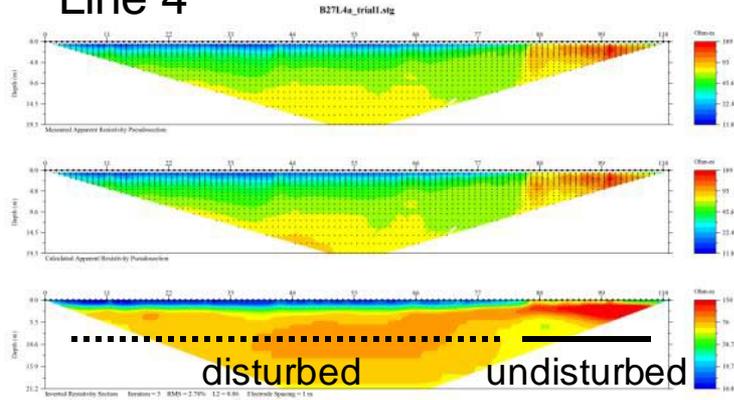


Line 3

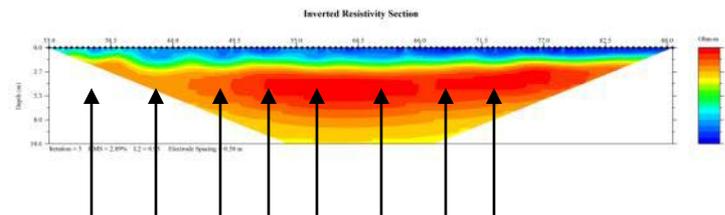
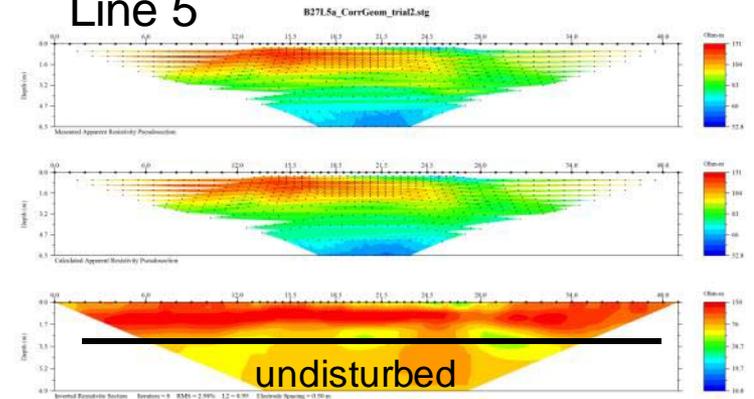


Earth Resistivity Imaging B-27

Line 4



Line 5



Trenches are evident as closely-spaced, shallow (<2.5 m), low-resistivity (blue) zones.

Earth Resistivity Imaging B-27



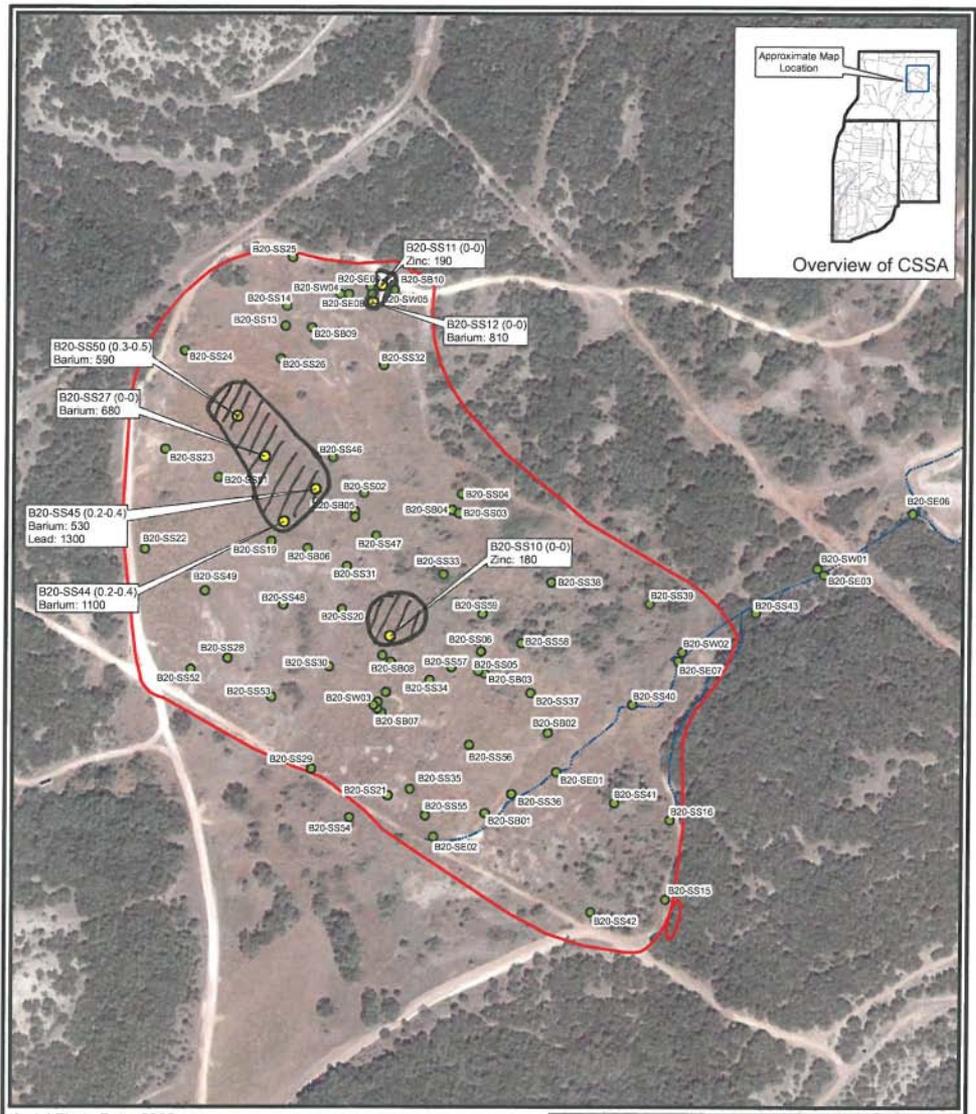
Fence diagrams in perspective view against aerial photograph of site.

(Not to scale)



2/2/2011

 - TENTATIVE excavation extent, surface soils only



Aerial Photo Date: 2008

 Soil sample location with COC concentrations detected above residential assessment levels (results in mg/kg)
 Soil sample location with COC concentrations detected below residential assessment levels, or not detected
 SWMU B-20/21 Boundary
 Intermittent Stream




Figure 4A-1
 Surface Soil COC Concentrations
 at SWMU B-20/21
 Camp Stanley Storage Activity
PARSONS

B-20 ALLTEM
 survey to coincide
 with planned
 excavations
 (Parsons)

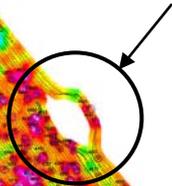


Deployment and Site Conditions



ALLTEM B-20 Anomaly Map (ZZM polarization)

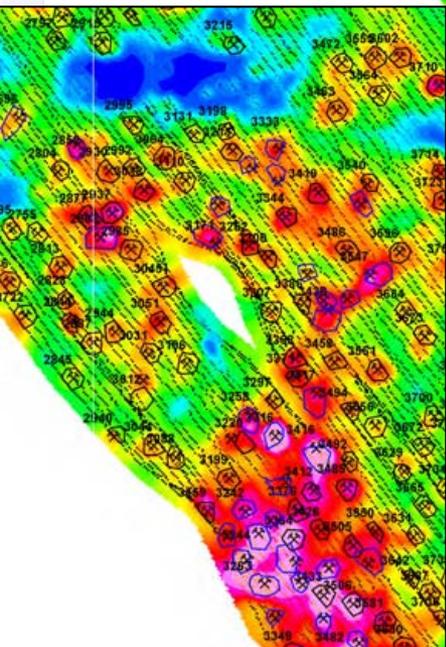
A detour around
difficult terrain.



❖ > 6220 anomalies

❖ Anomaly density
ranges from low in
northern part to high
in southern part.

❖ Anomaly clusters
of different sizes and
geometries



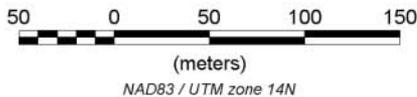
Zoom
box

B-20 Target Map



❖ > 2780 targets picked for inversion

❖ Uneven distribution

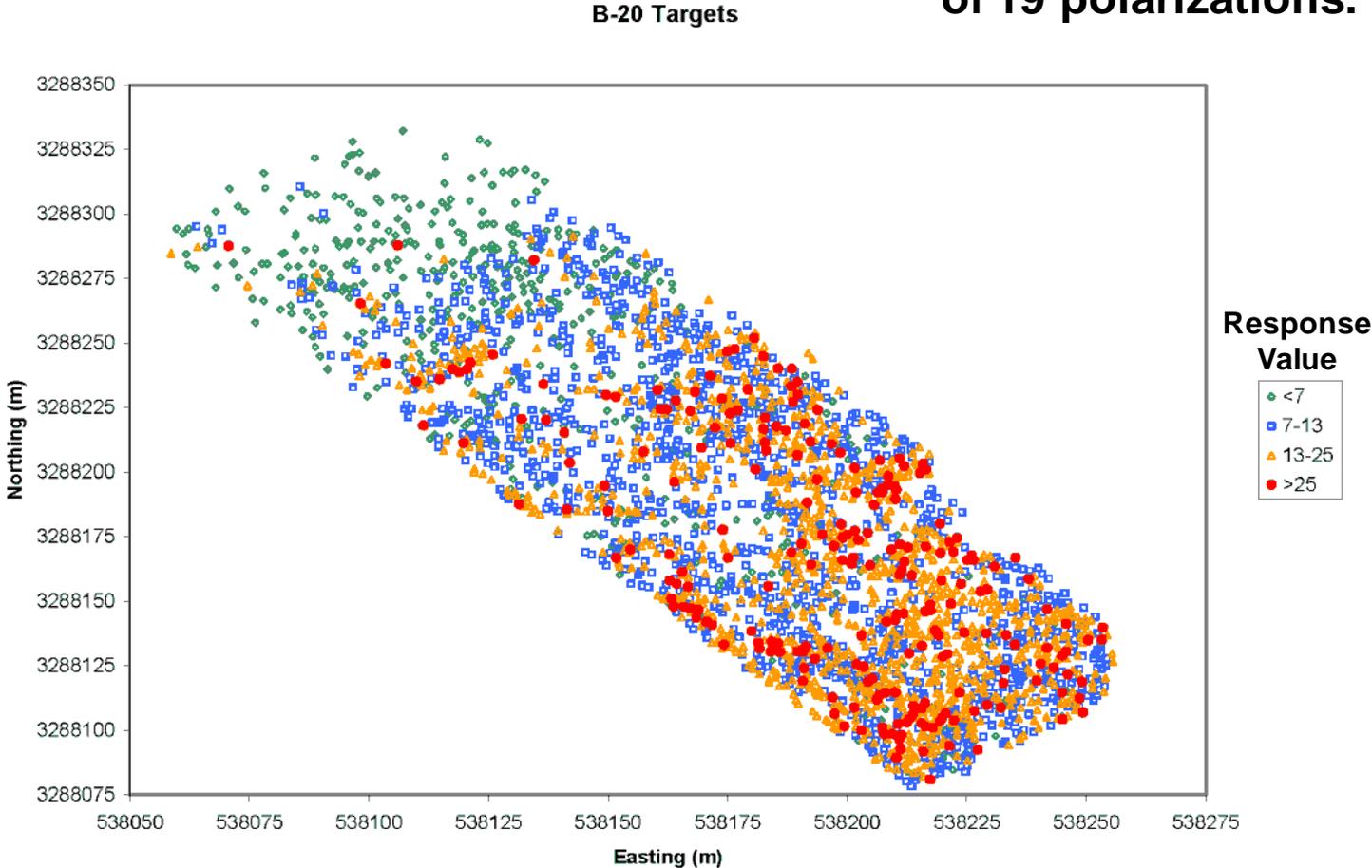


CSSA
B-20

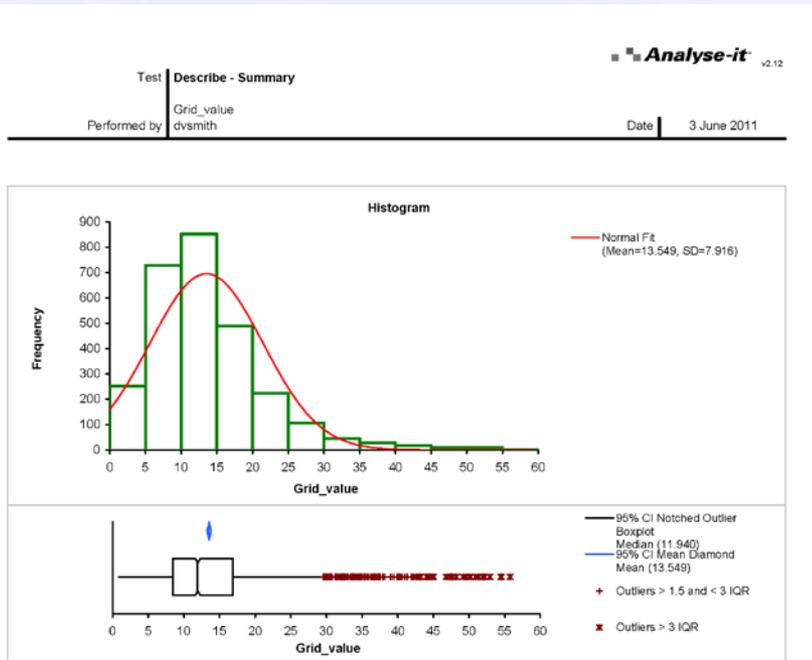
— ALLTEM
Survey Area
(~5 acres)

B-20 Target Response-Value Distribution

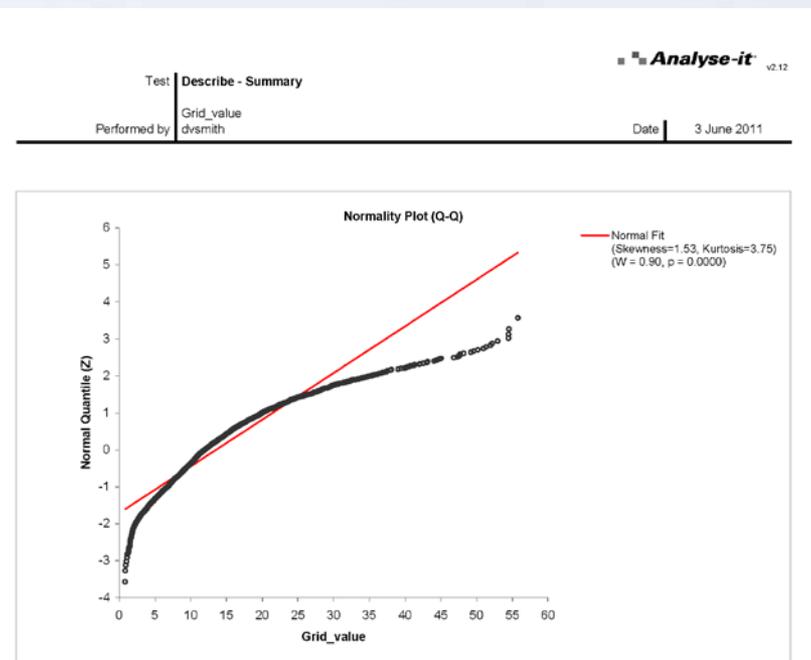
Targets classed by combined response of 19 polarizations.



B-20 Target Response-Values Descriptive Statistics



n	2760	Median	11.940
Mean	13.549	95.0% CI	11.640 to 12.280
95% CI	13.254 to 13.845	Range	54.94
SE	0.1507	IQR	8.450
Variance	62.660	Percentile	
SD	7.916	0th	0.830 (minimum)
95% CI	7.712 to 8.130	25th	8.430 (1st quartile)
CV	58.4%	50th	11.940 (median)
Skewness	1.53	75th	16.880 (3rd quartile)
Kurtosis	3.75	100th	55.770 (maximum)
Shapiro-Wilk W	0.90		
p	<0.0001		

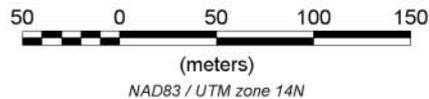
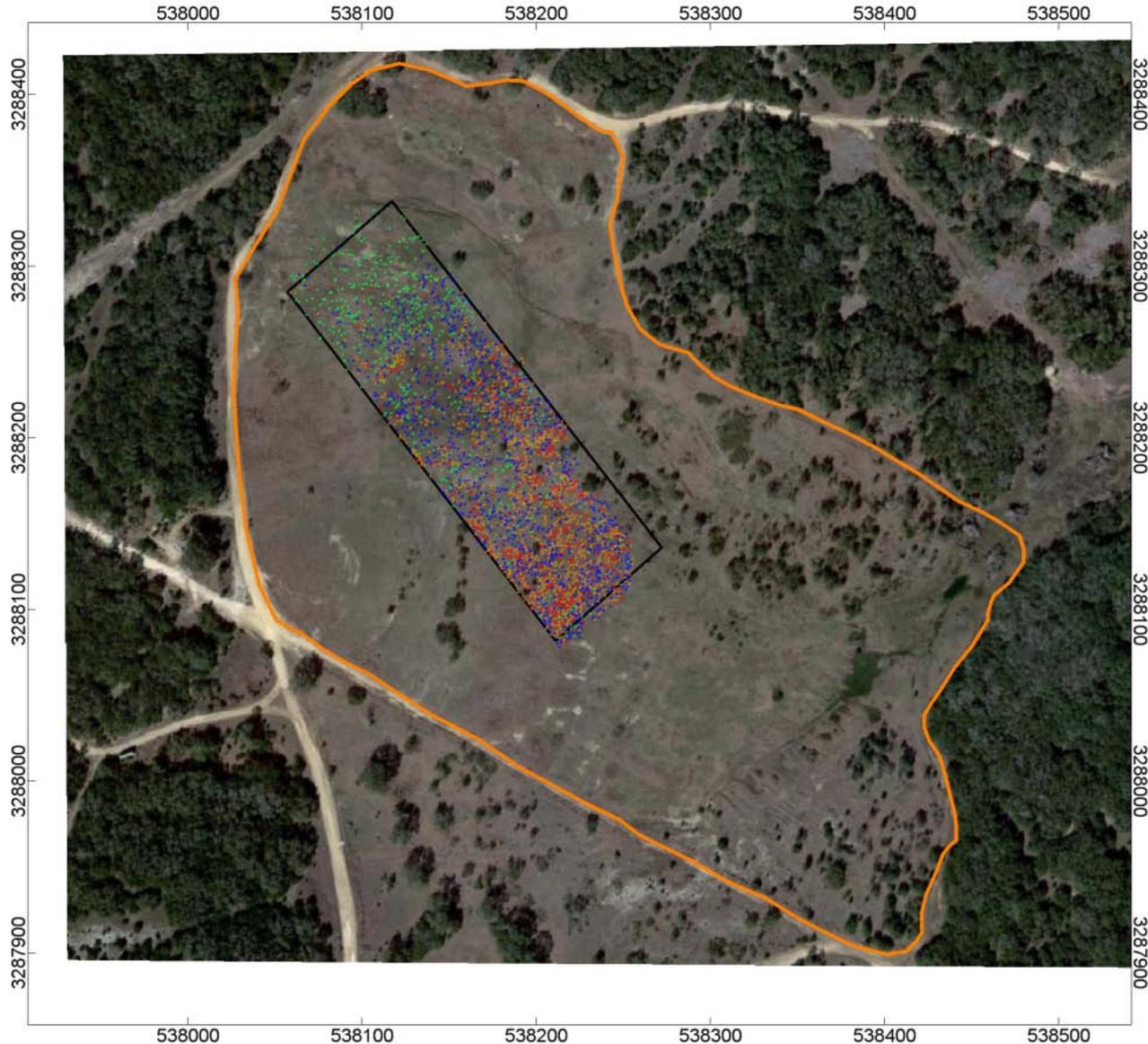


Distribution not normal because response-value is not a function of a random process.

Distribution is skewed to smaller response values.

B-20 ALLTEM TARGETS

Targets classed into four categories according to combined response of 19 polarizations.



CSSA
B-20

ALLTEM
Survey Area
(~5 acres)

Current and Planned Activities

- **Current:**

1. Complete ALLTEM survey of B-27
2. Survey more area of B-20 using ALLTEM
3. Finish inversion of B-20 targets (Feb. dataset)

- **Planned:**

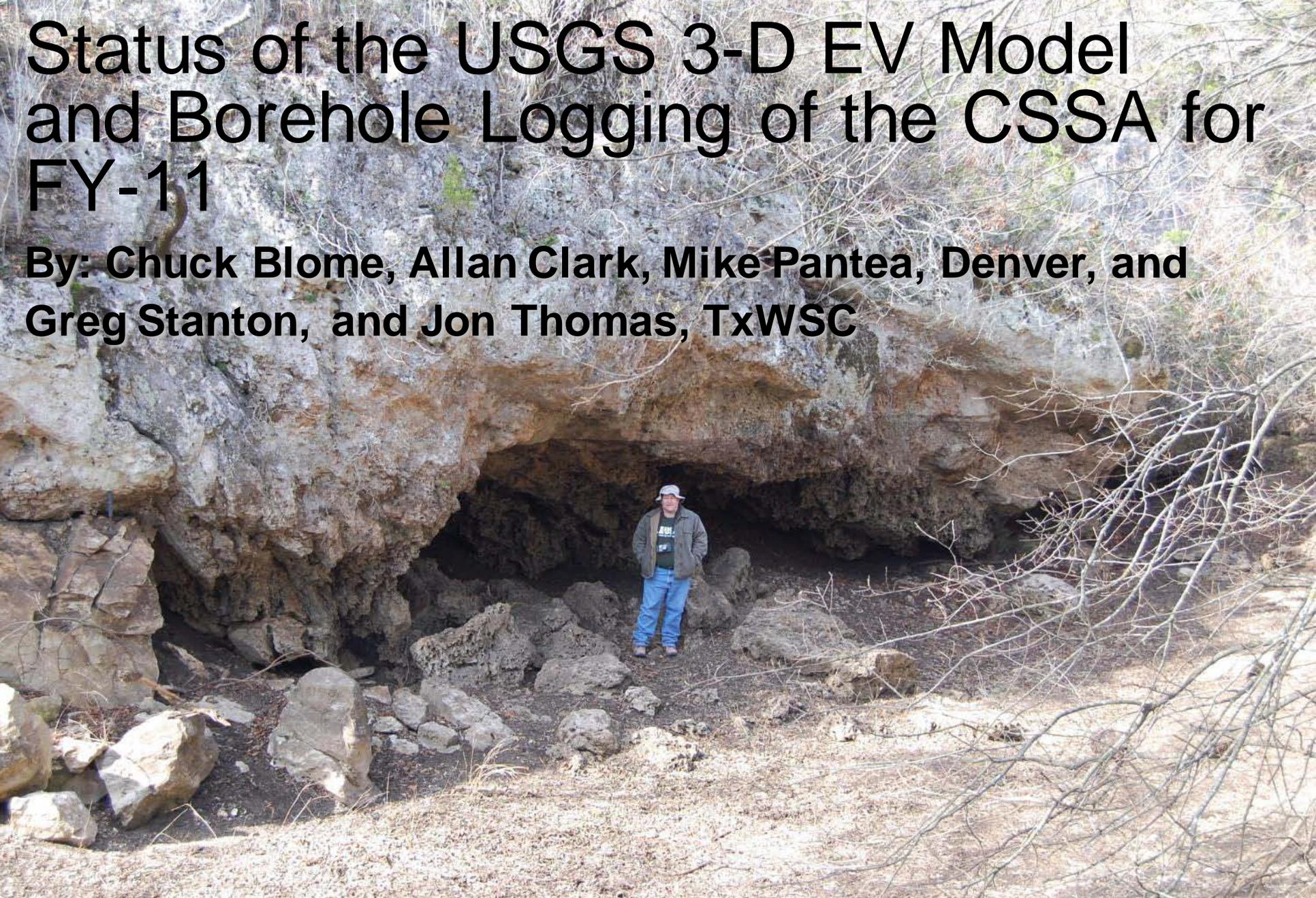
1. ALLTEM survey of B-24
2. GEM2 survey of AOC-74



GROUNDWATER UPDATE

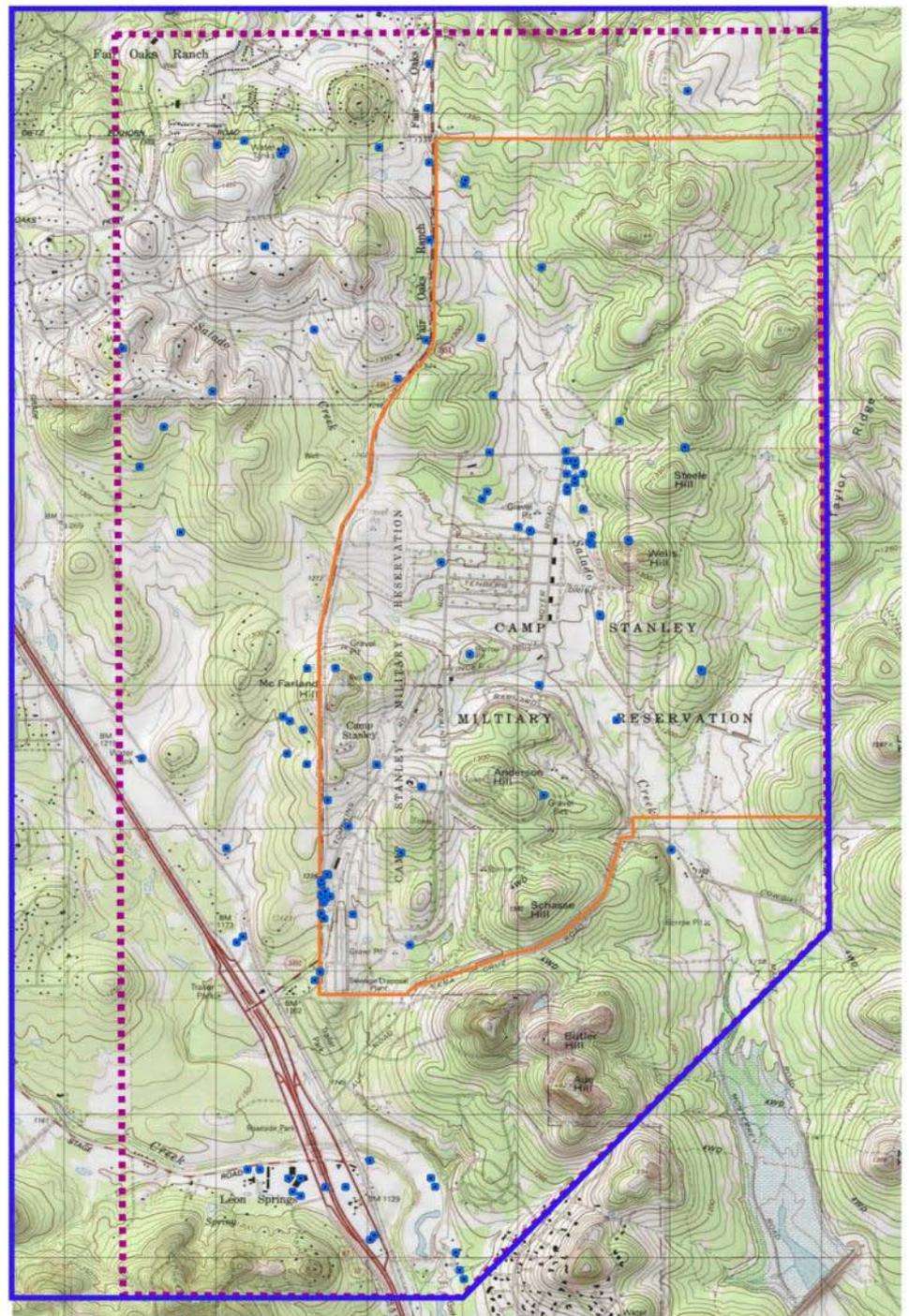
Status of the USGS 3-D EV Model and Borehole Logging of the CSSA for FY-11

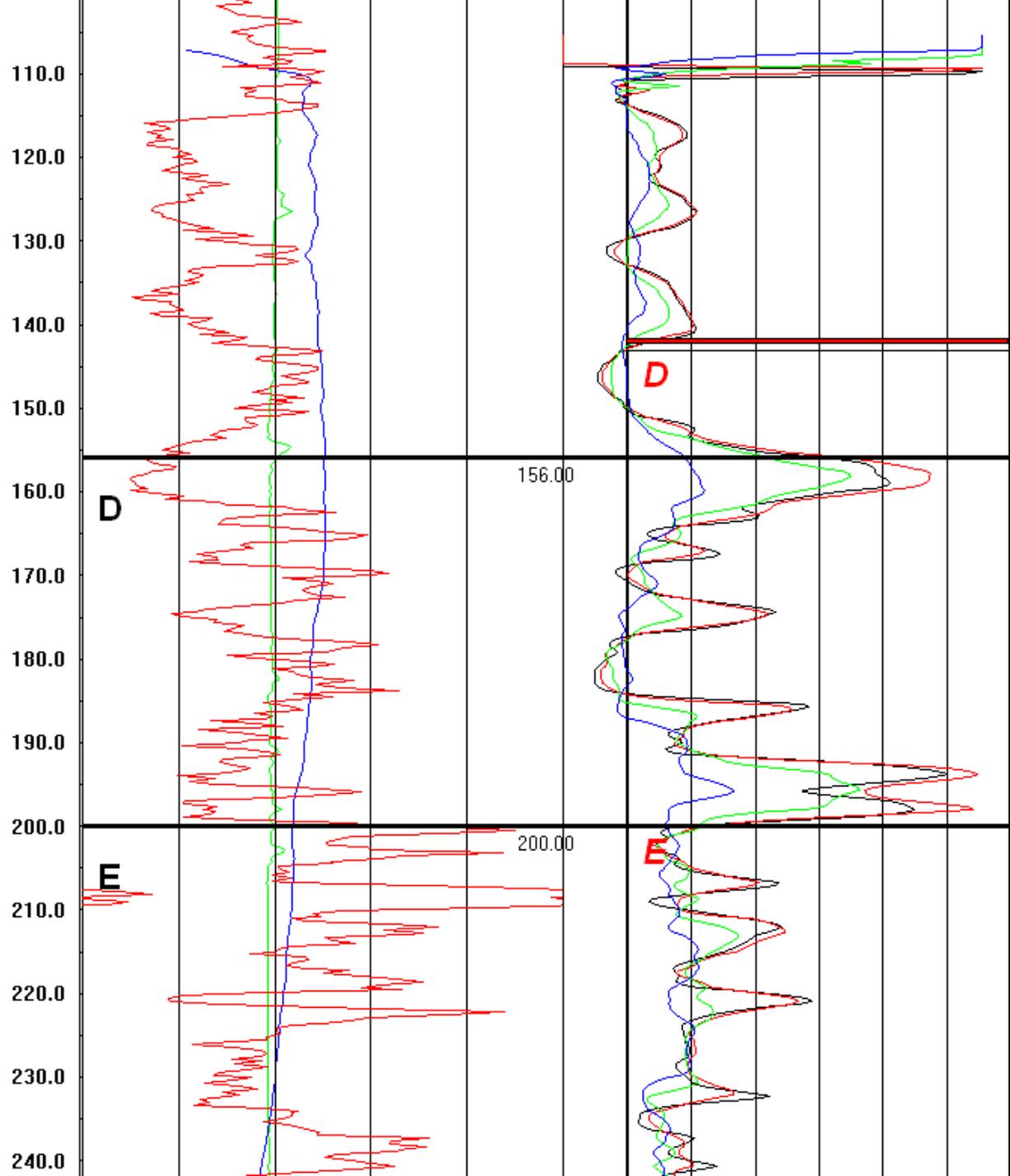
By: Chuck Blome, Allan Clark, Mike Pantea, Denver, and Greg Stanton, and Jon Thomas, TxWSC



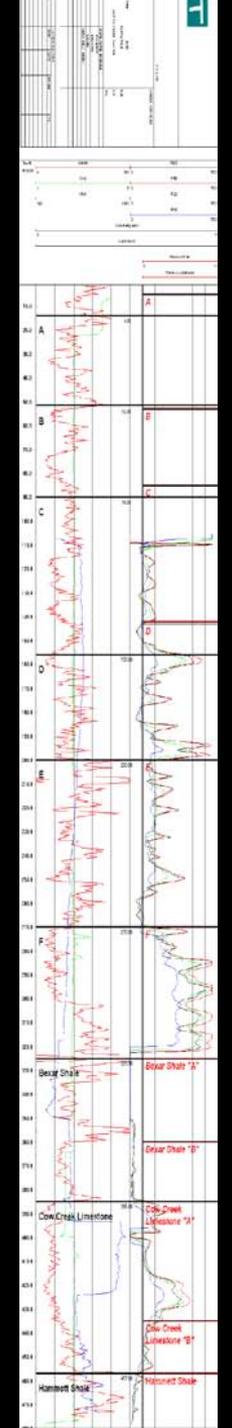
CSSA 3-D EV Model

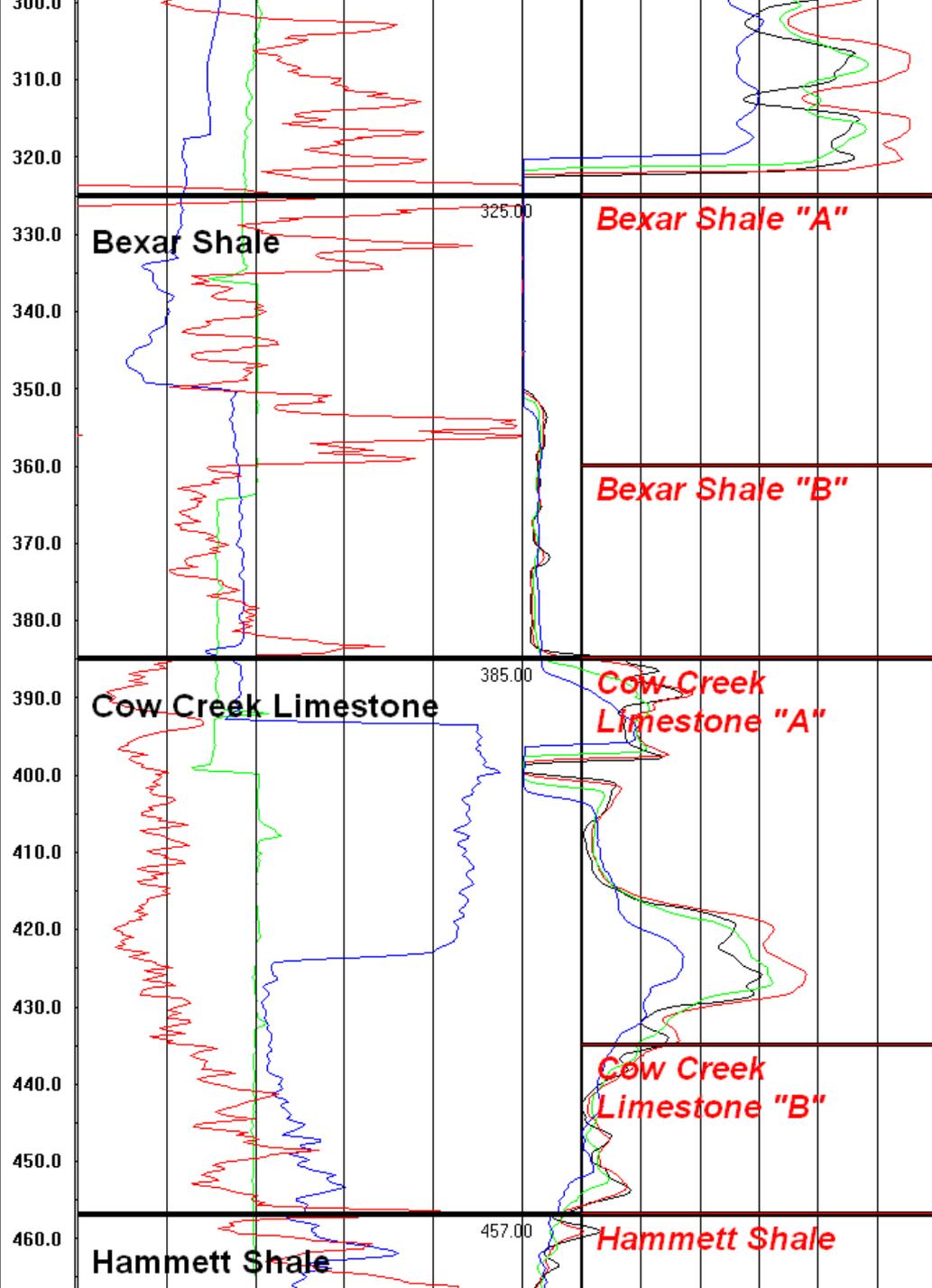
- Establish model volume
- Select the wells
- QC all well logs and picks (td's)
- Type Log MW9-CC
- Surface geology (top layer)
- Construct from basement up





Previous Contact





Contact Not Used

Contact Not Used

Helium Gas Expansion Analysis

Porosity Estimates
By:

- HE Gas Injection
- Neutron Well Logs
- 55 plugs collected from
- Well Core MW-5LGR

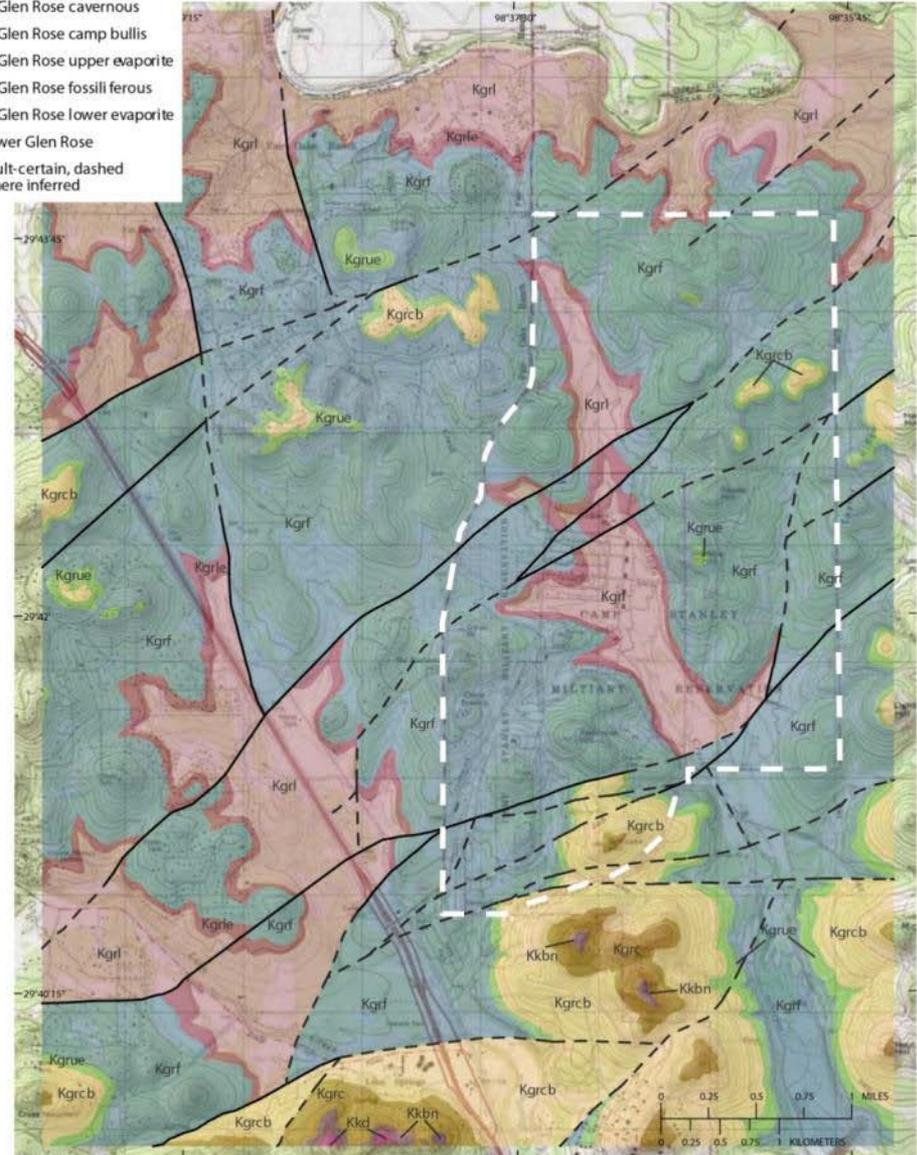
1 by 2 inch plugs required



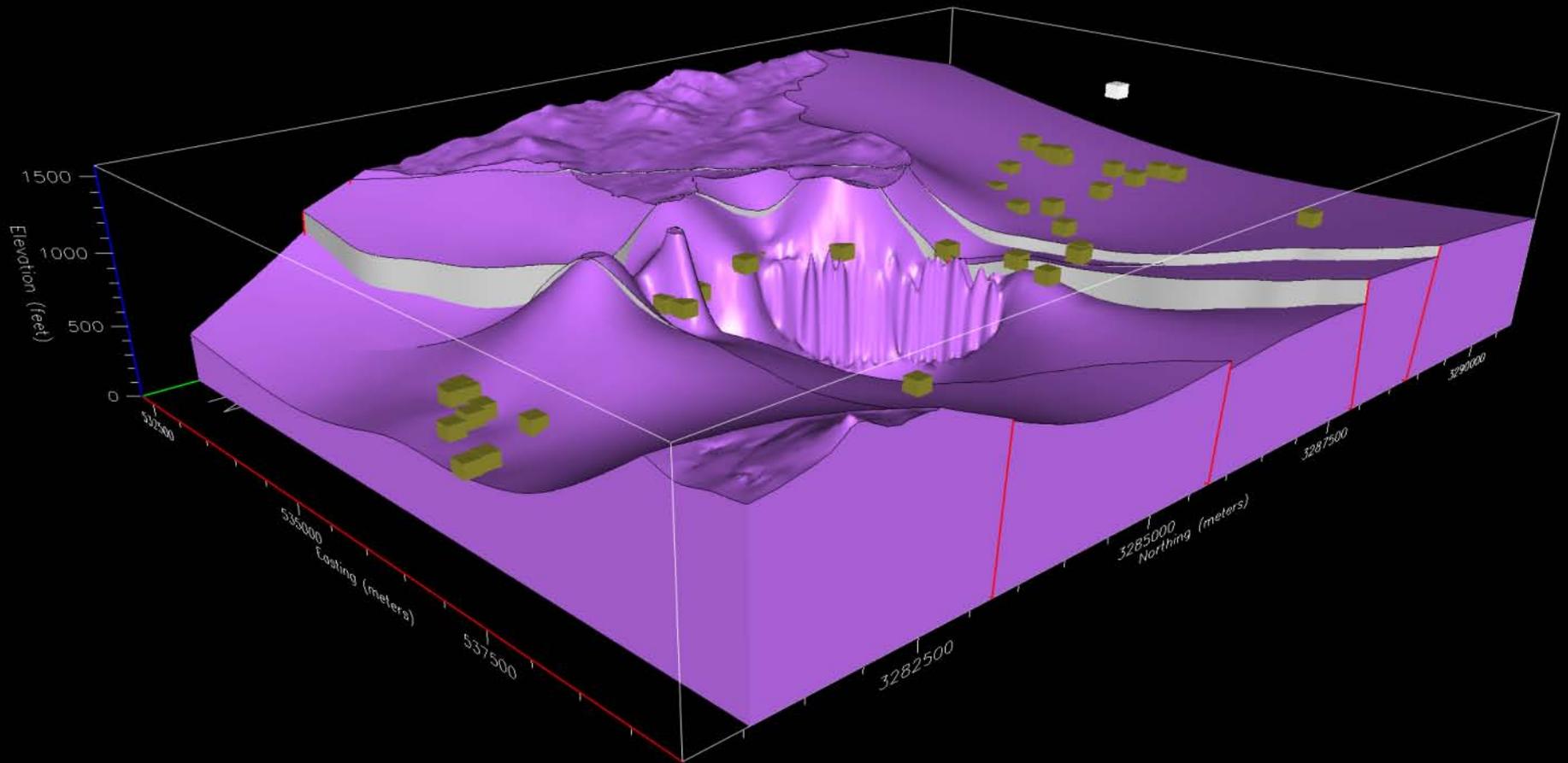
CSSA 3-D EV Model

- 102 wells
- 16 model layers
 - 2-Edwards
 - 5-Upper Glen Rose
 - 6-Lower Glen Rose
 - 1-Bexar Shale
 - 1-Cow Creek
 - 1-Pine Is. (Hammett)
- 1 major fault
- 5-6 minor faults

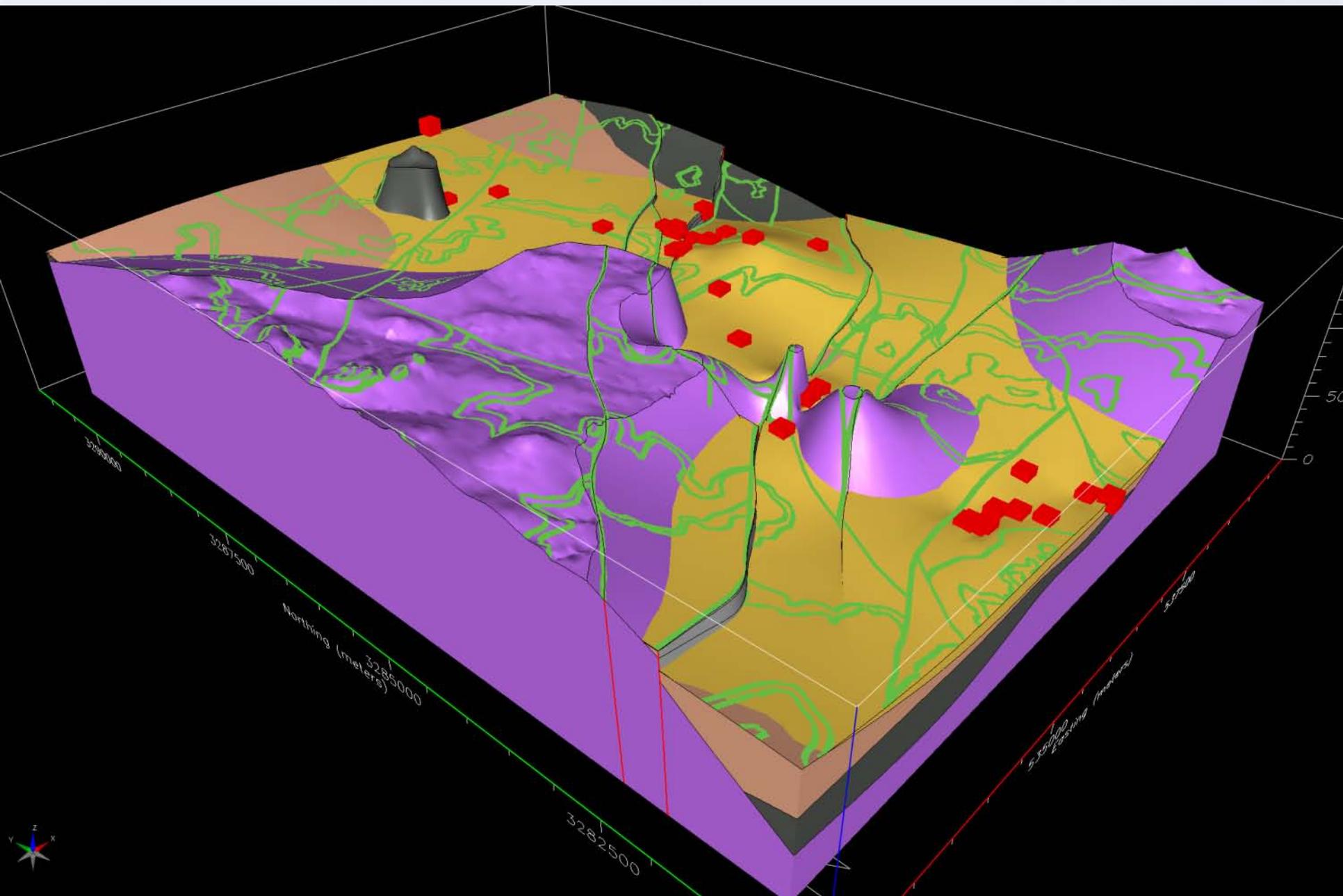
EXPLANATION	
Kkd	Dolomitic
Kkbn	Basal nodular
Karc	U. Glen Rose cavernous
Kgrcb	U. Glen Rose camp bulls
Kgrue	U. Glen Rose upper evaporite
Kgrlf	U. Glen Rose fossiliferous
Kgrle	U. Glen Rose lower evaporite
Kgrf	Lower Glen Rose
---	Fault-certain, dashed where inferred



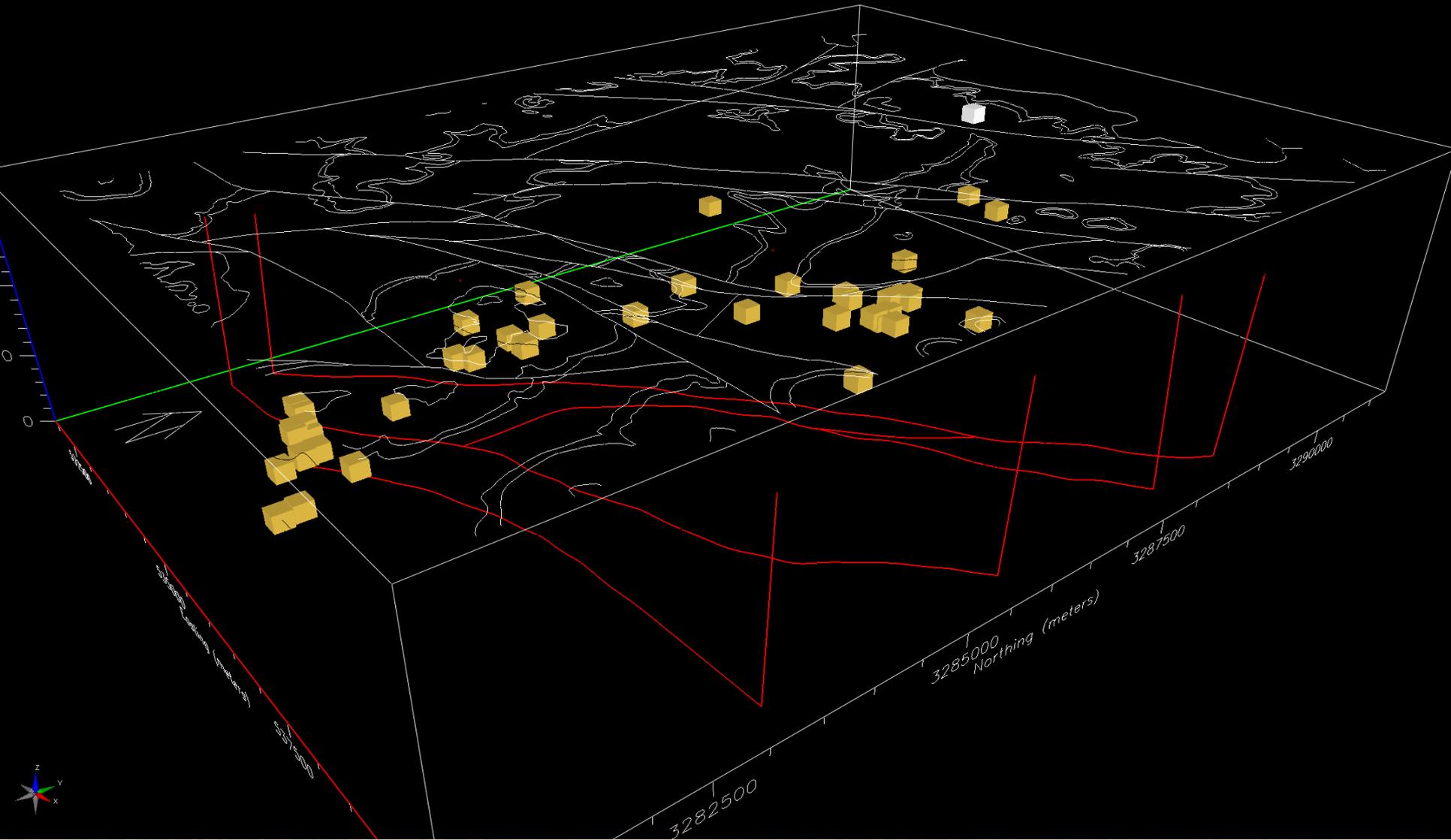
Preliminary 3-D EV Model - Hammett



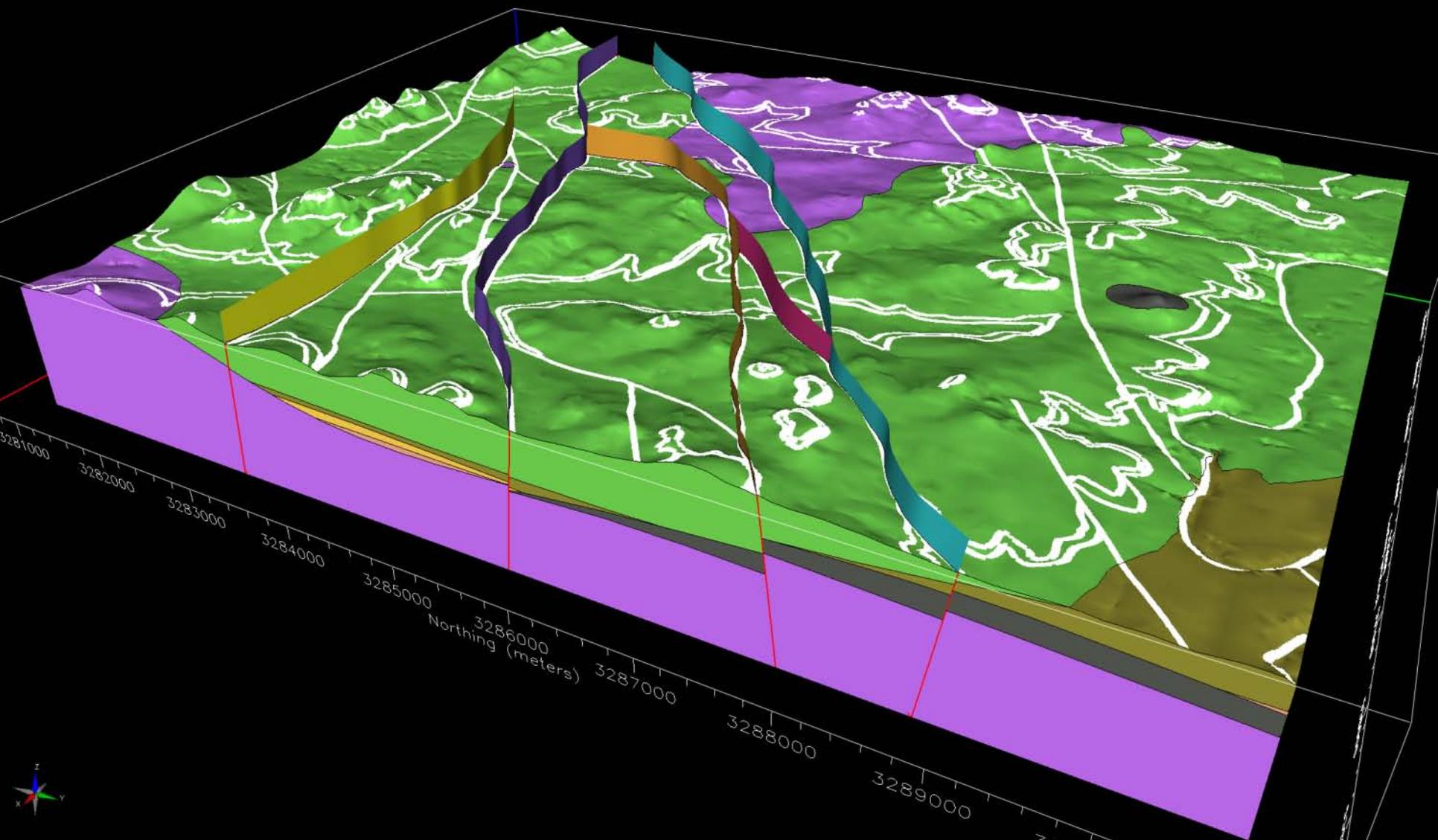
Preliminary 3-D EV Model – 3-Layer



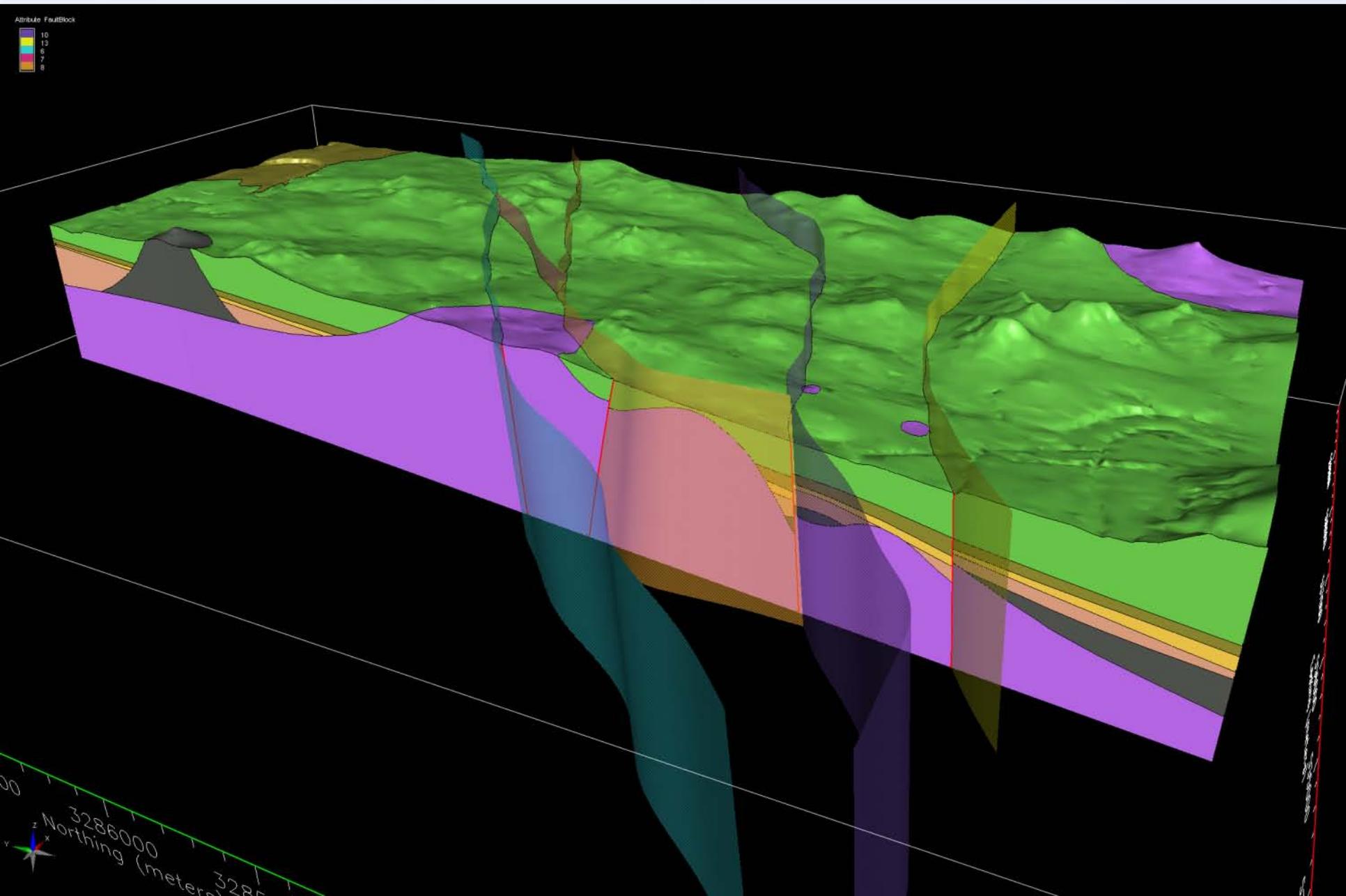
Preliminary 3-D EV Model – 3-Layer



Preliminary 3-D EV Model – 5-Layer



Preliminary 3-D EV Model – 5-Layer

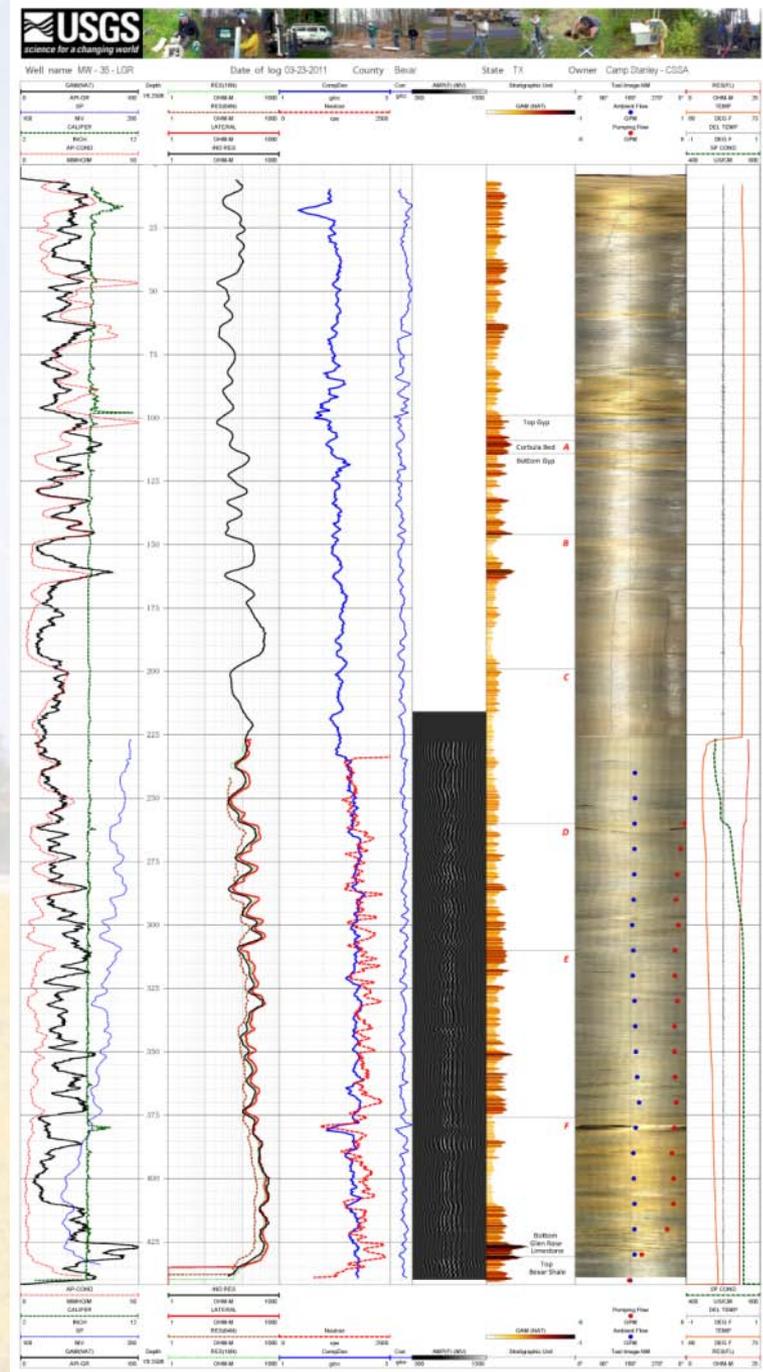


2011 USGS Borehole Geophysical Surveys at CSSA

Location	ID	Actual Well Completion	Actual Well Depth (ft bgs)	Logged Casing Depth (ft bgs)	Well Diameter (inches)	Caliper	Gamma	Spontaneous Potential	Normal Resistivity	Fluid Resistivity	Temperature	EM Induction	Optical Televiwer	EM Flowmeter	Sonic	Neutron	Gamma-Gamma Density
Off-Post	I10-4	Cased Open Borehole	361	44	6	<input checked="" type="checkbox"/>											
Off-Post	LS-5	Cased Open Borehole	472	300	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
Off-Post	LS-4	Cased Open Borehole	481	204	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
On-Post	MW27	PVC Monitoring Well	17	7	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-Post	MW32	PVC Monitoring Well	56	26	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-Post	B3-EXW02	Cased Open Borehole	358	65	8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
On-Post	CS-11	Cased Open Borehole	553	378	12.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
On-Post	MW-35-LGR	Cased Open Borehole	440	2	8	<input checked="" type="checkbox"/>											
On-Post	MW-36-LGR	Cased Open Borehole	385	2	8	<input checked="" type="checkbox"/>											
Off-Post	JW-15	Cased Open Borehole	34	350	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

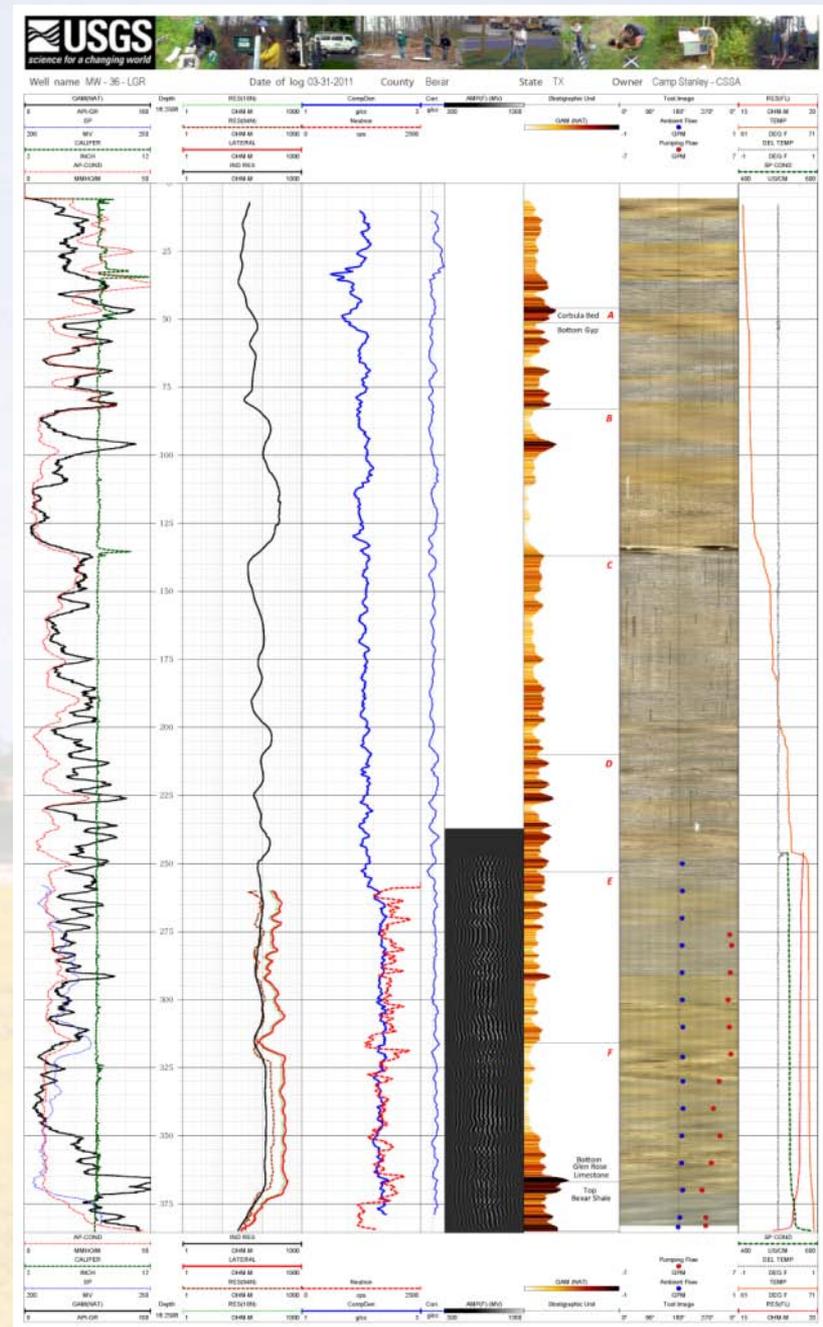
Composite Log MW-35-LGR

- Gamma
- SP
- Caliper
- Temperature
- Resistivity
 - Normal
 - Induction
 - Fluid
- Gamma-Gamma Density
- Neutron
- Full Wave Sonic
- Optical Image
- EM Flowmeter



Composite Log MW-36-LGR

- Gamma
- SP
- Caliper
- Temperature
- Resistivity
 - Normal
 - Induction
 - Fluid
- Gamma-Gamma Density
- Neutron
- Full Wave Sonic
- Optical Image
- EM Flowmeter



Borehole Geophysical Data Provided

- LAS files
- WellCad files
- Hard Copy
- Borehole Videos

Contact Info:

Greg Stanton – gstanton@usgs.gov

Jon Thomas – jvthomas@usgs.gov

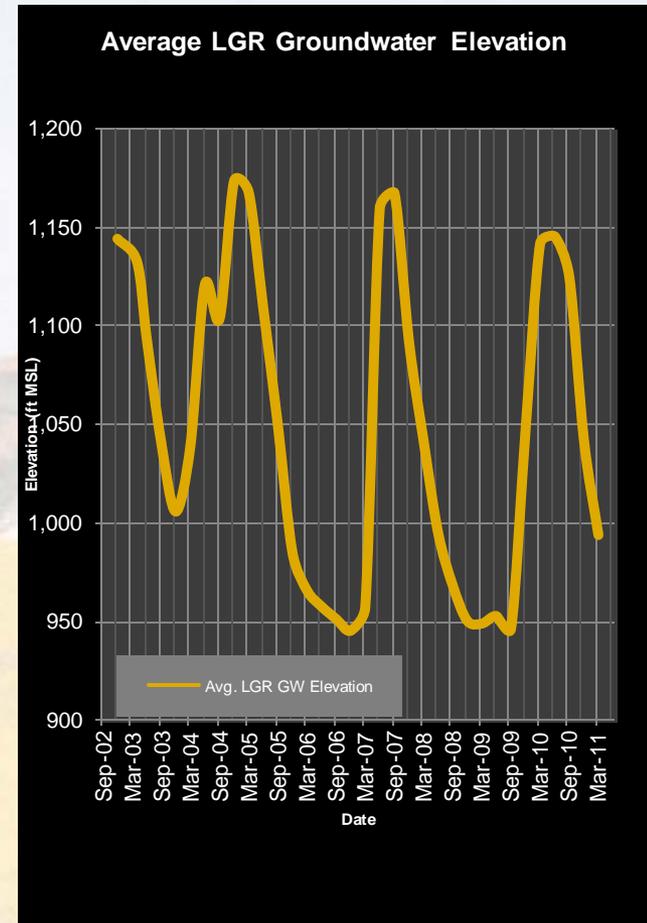
Groundwater Monitoring Program Overview

- Quarterly Monitoring Program:
 - On-post since December 1999: 46 events
 - Off-post since September 2001: 39 events
- Wells included:
 - 44 On-post monitoring wells
 - 2 On-post drinking water supply wells
 - 2 On-post former drinking water wells
 - 1 Future drinking water well
 - 4 Westbay[®]-equipped wells
 - 59 Off-post private and public supply wells
- 5 off-post wells have GAC units due to past exceedances

Groundwater Monitoring Program

Recent Changes

- Central Texas has been experiencing a drought, receiving only 5.5 inches of rainfall between October 2010 and May 2011. In 2011, there has only been 3.4 inches of rainfall.
- Aquifer levels have dropped more than 150 feet in 8 months, affecting the yield of groundwater from the production wells.
- 8 new municipal supply wells (The Oaks WSC) have been added to the monitoring program. These wells are located 1.5 miles west of CSSA, across IH-10.



Groundwater Monitoring Program

Recent Changes

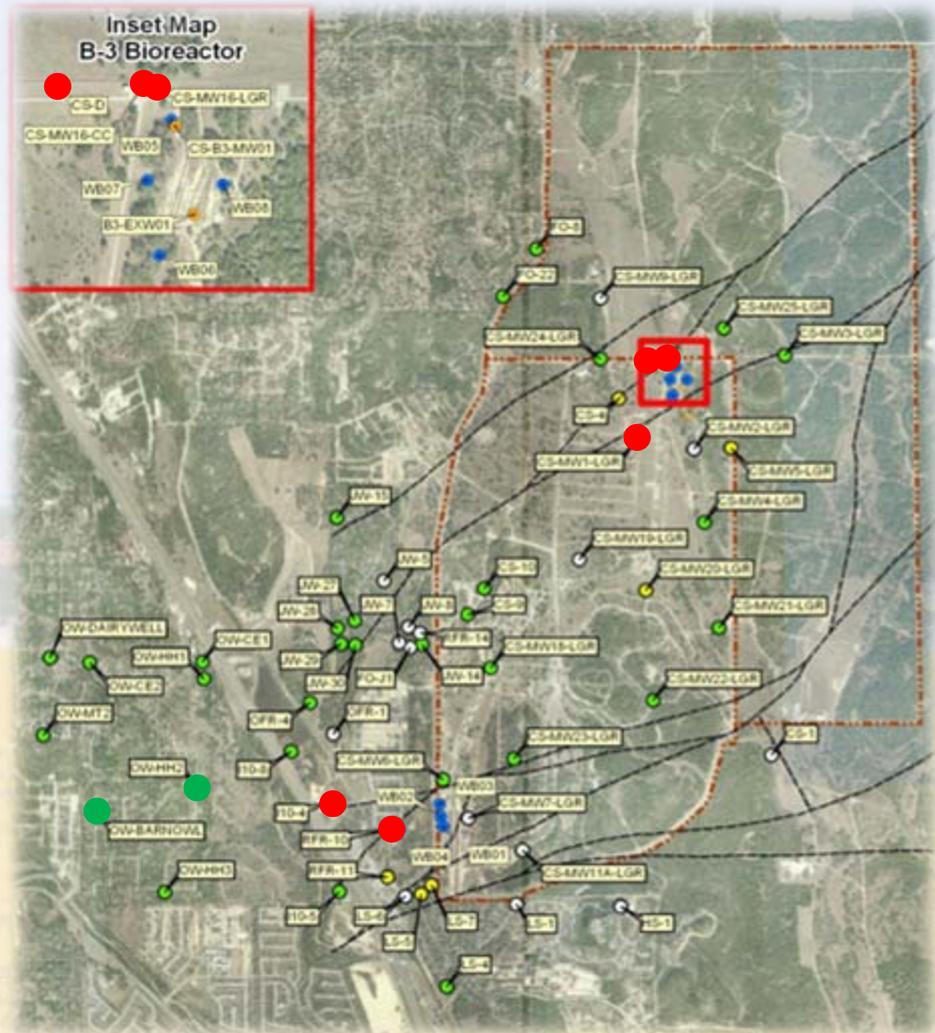
- The 2010 LTMO and DQO updates were approved by the EPA and TCEQ. The new LTMO plan is being implemented in June 2011 (“snapshot” event including all wells).
- Two new LGR wells have been installed in the southern portion of the post in the Plume 2 area.
- Supply well CS-12 has been added to the groundwater monitoring schedule. No VOCs have been reported. CSSA is currently completing construction activities to start-up the well for production.



Groundwater Monitoring Program

March 2011 Results Overview

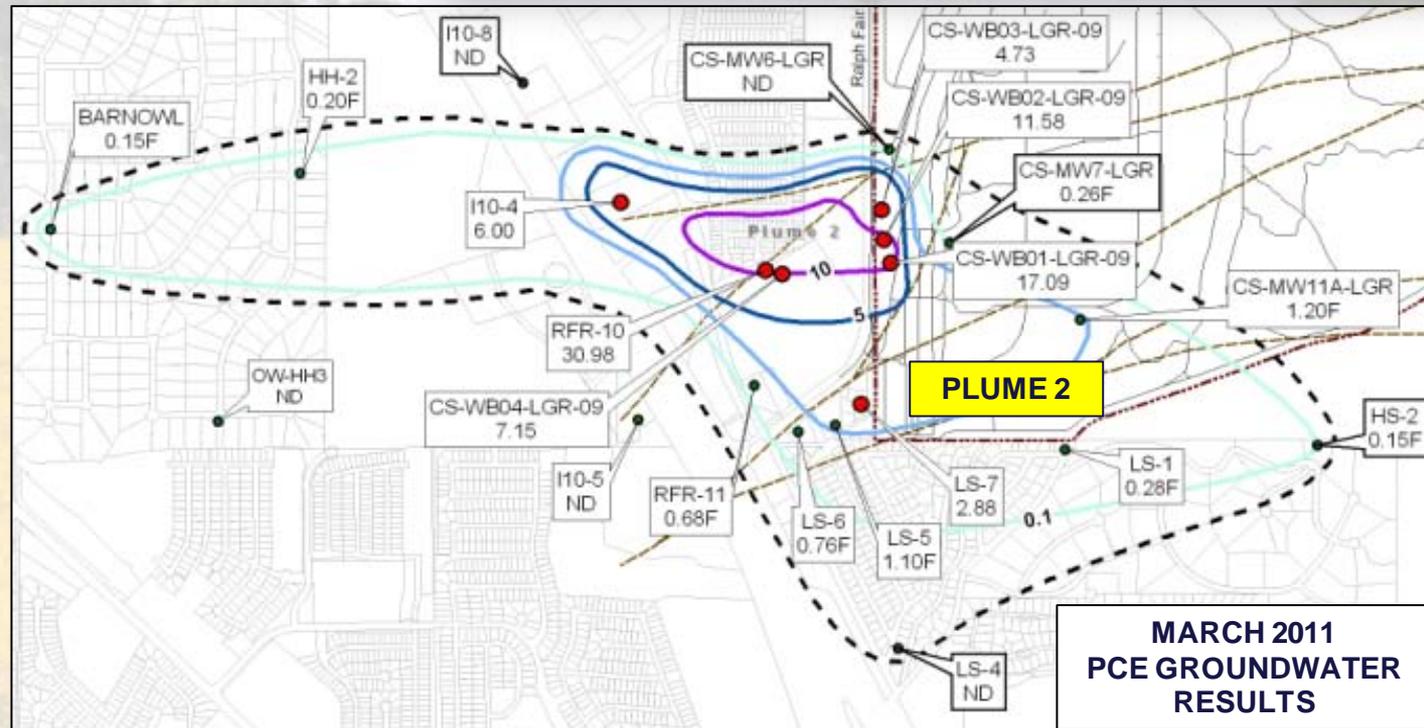
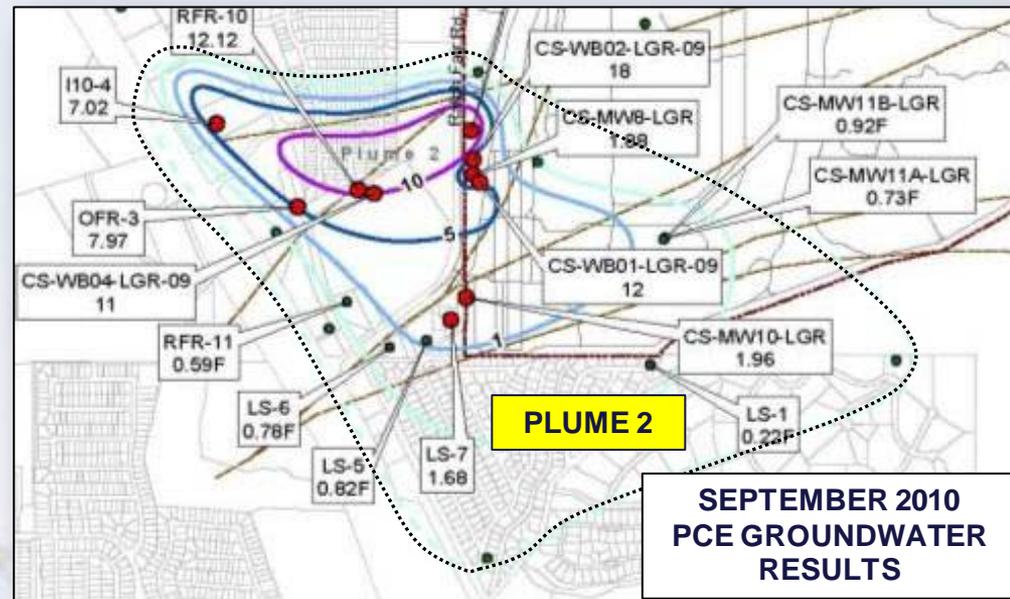
- One quarterly groundwater event since last meeting. This is the last event that used the 2005 DQO/LTMO programs. 24 On-Post and 34 Off-Post wells were sampled.
 - The same four On-Post and two Off-Post wells continue to exceed the MCL for either PCE, TCE, or *cis*-1,2-DCE.
 - Lead above AL in CS-MW16-LGR for the first time since 2002.
 - CS-4, which had spiked after the bioreactor flood test, has returned to below MCL concentrations.
 - Off-Post well I10-4 continues to hover above the PCE MCL at 6.00 µg/L. The well continues to remain inactive.
 - Two of The Oaks WSC wells added to quarterly sampling were positive for trace hits of PCE (0.15F and 0.20F at the Barn Owl and HH-2 wells, respectively).



Groundwater Monitoring Program

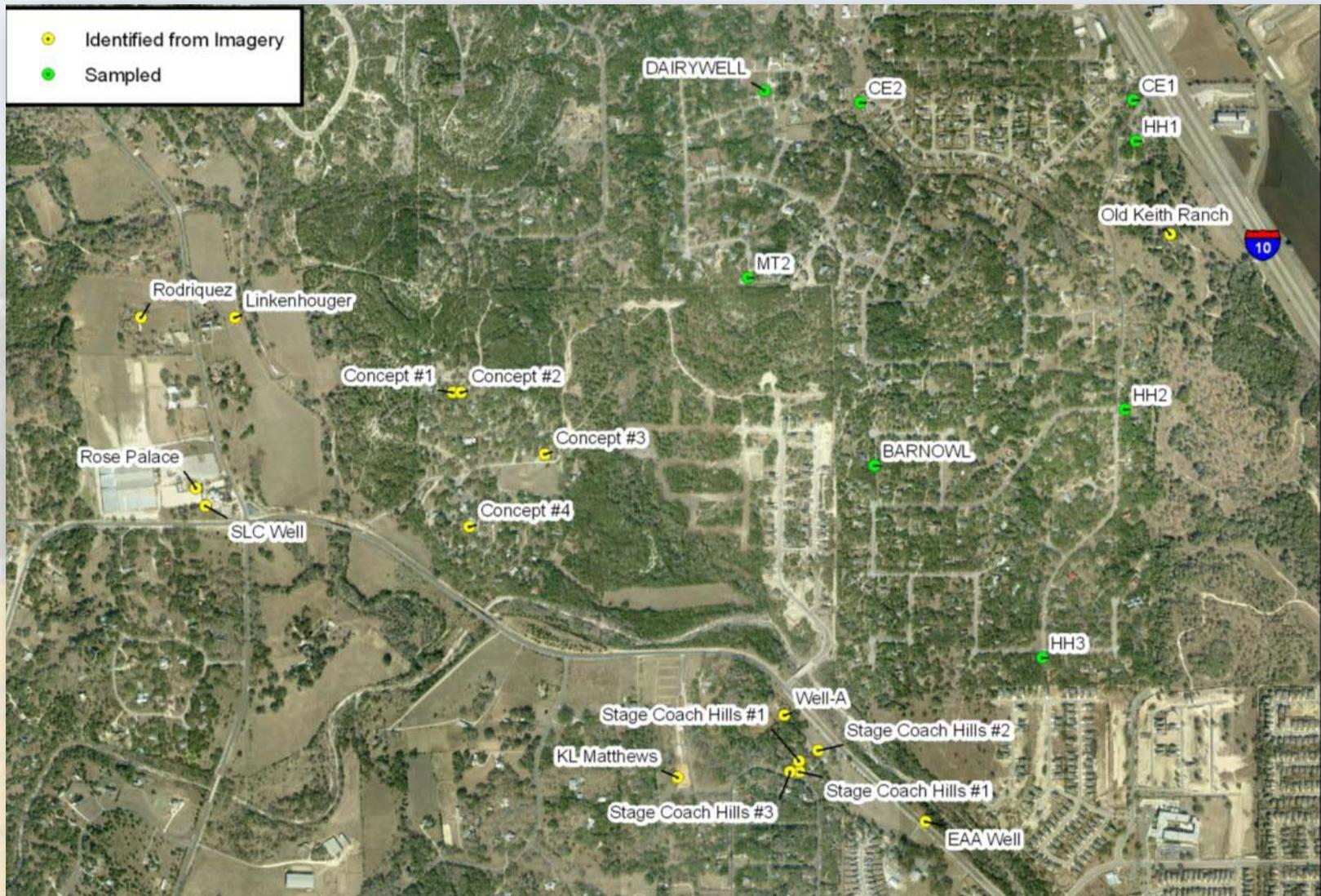
March 2011 Plume 2

- The detection of PCE at The Oaks WSC is significant because it extends the margin of the plume to 1 mile west of I10-4 well.
- PCE contamination now detected 1.5 miles west of CSSA boundary.



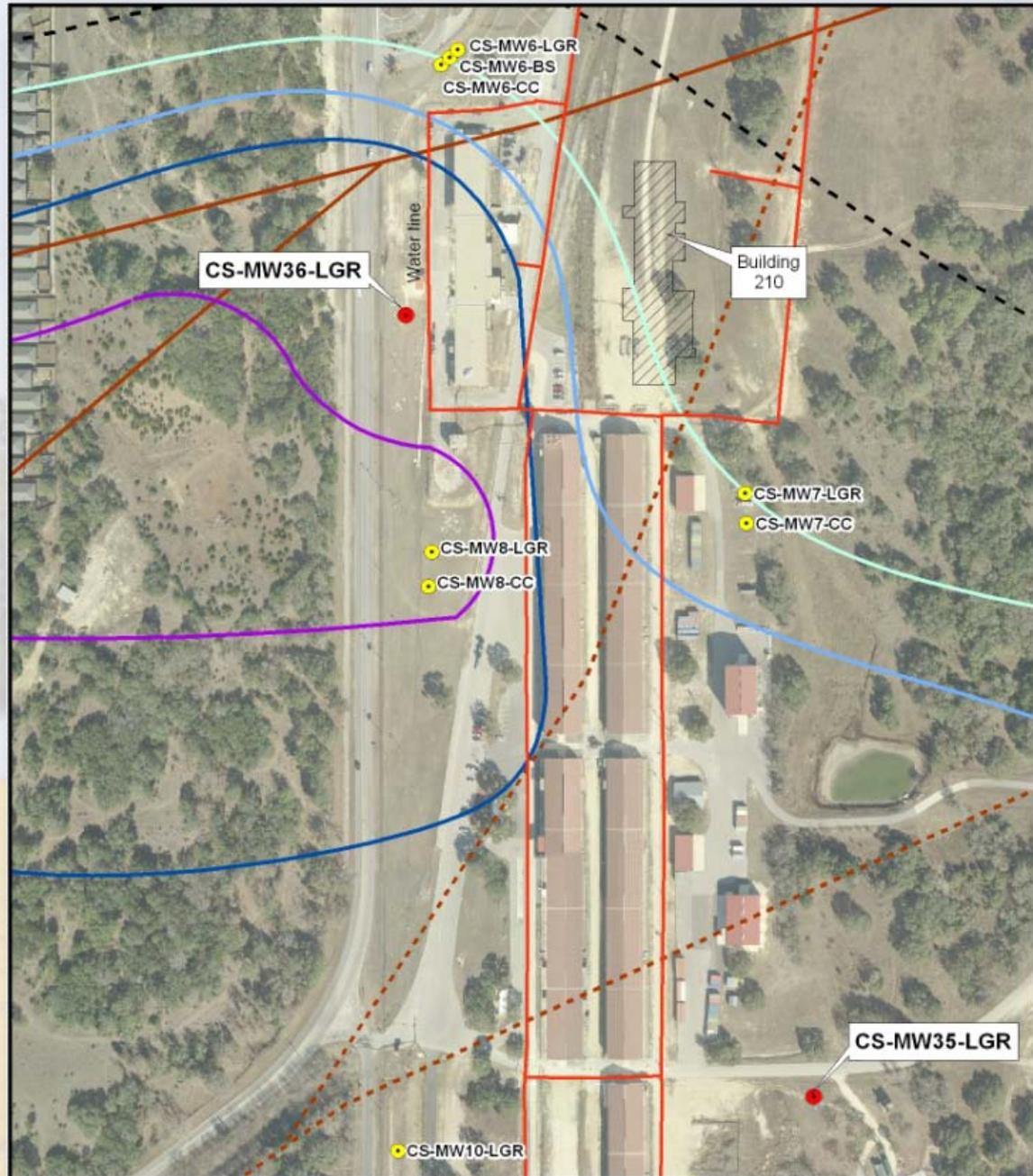
Groundwater Monitoring Program

Future Potential Sampling Locations



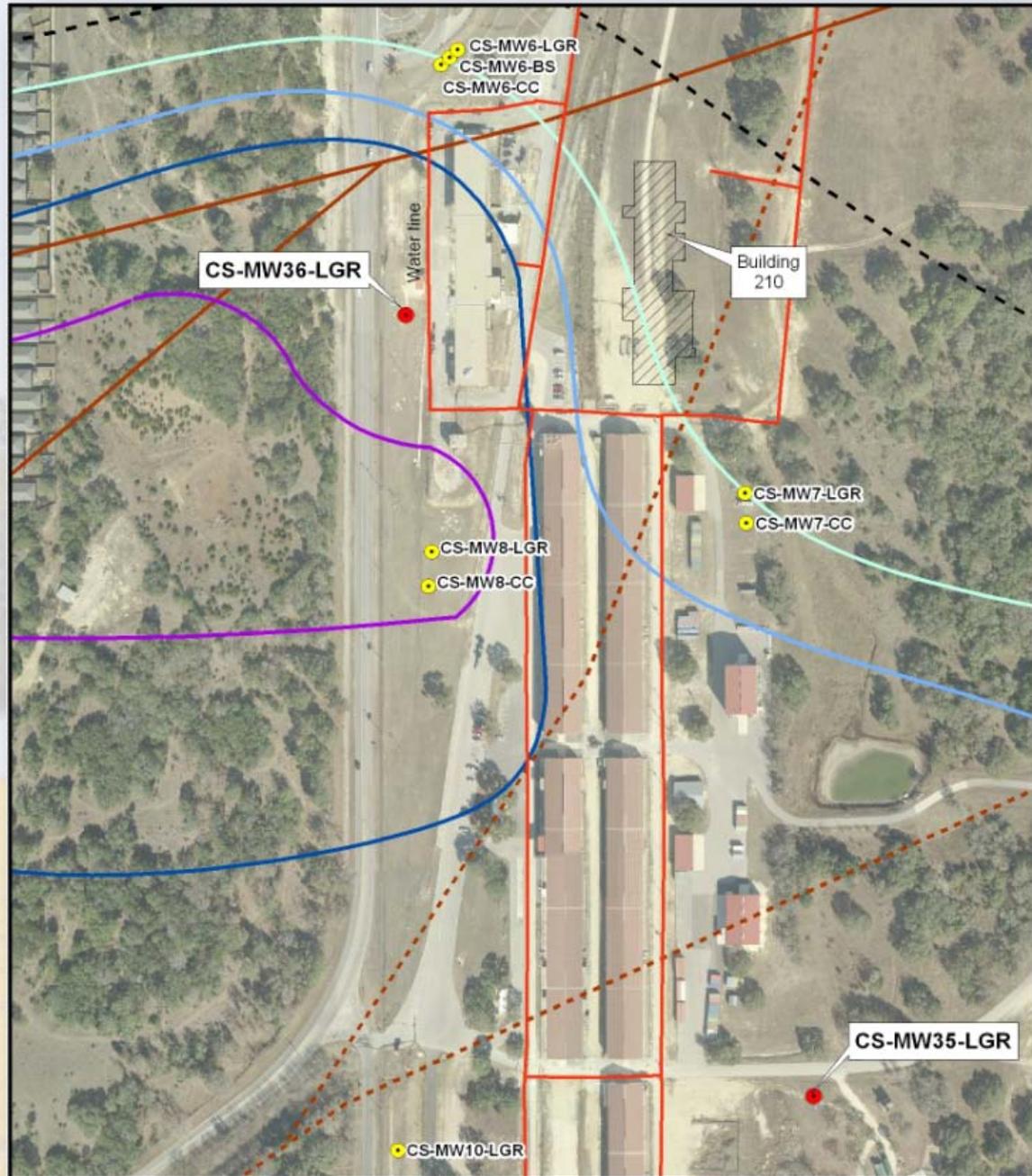
Groundwater New Wells

- Two new LGR wells have been drilled at the south end of the post within Plume 2 in March/April 2011.
- **CS-MW35-LGR** is located 1,580 feet S-SE of Building 90, on the downthrown side of fault (TD = 430' bgs).
- **CS-MW36-LGR** is located 100 feet West of Building 90 along property fenceline (TD = 370' bgs).



Groundwater New Wells

- Wells were geophysically logged by USGS.
- **Discrete Interval Packer Tests were conducted:**
- **CS-MW35-LGR**
 - 259-271': 0.3F µg/L PCE
 - 374-386': 2.8 µg/L PCE
 - 414-426': 2.7 µg/L PCE
- **CS-MW36-LGR**
 - 0-142': 25 µg/L PCE
13 µg/L TCE
0.11F µg/L CF
0.44F µg/L CM
 - Chlorine products could be due to leak in water line.
 - 320-332': 23 µg/L PCE
15 µg/L TCE



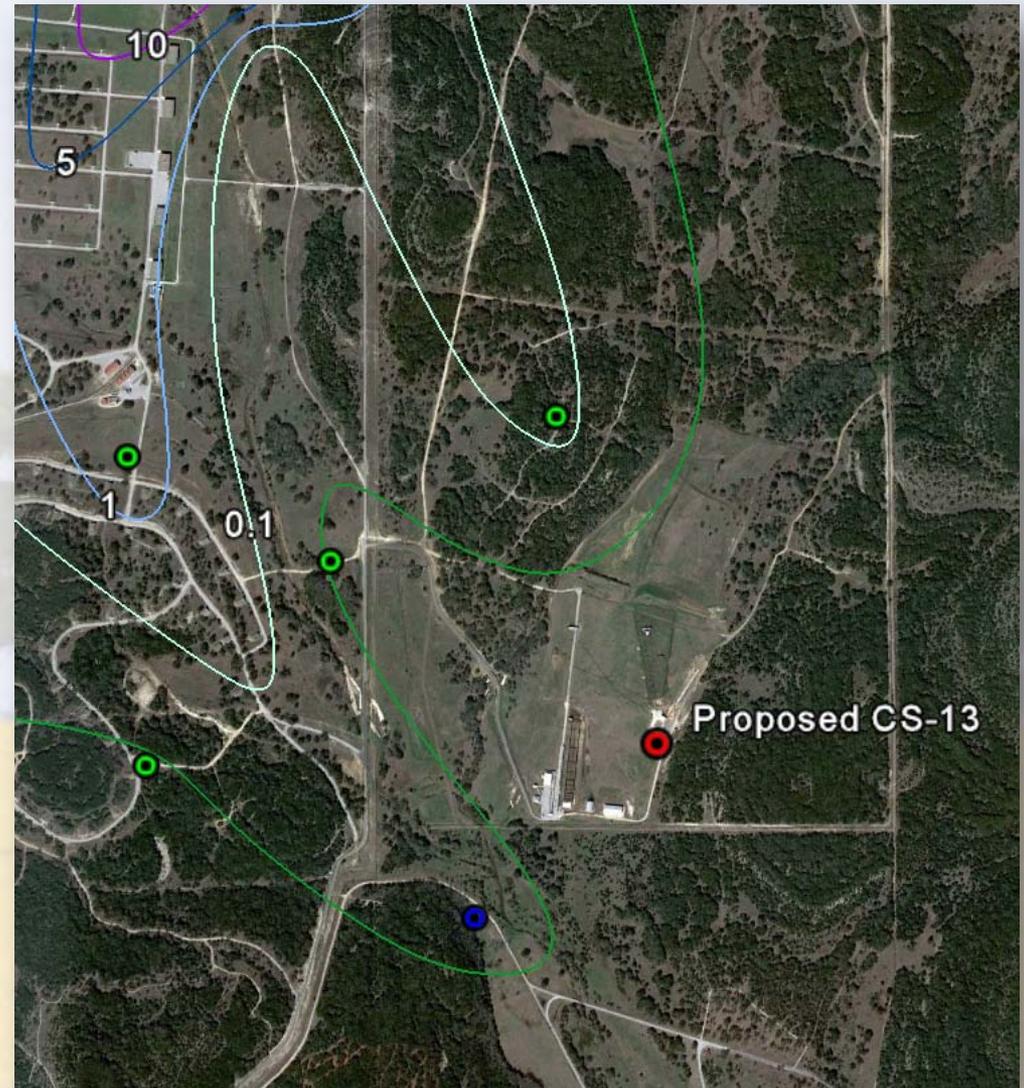
Supply Well CS-12

- Construction efforts at CS-12 are nearly complete. The housing, disinfection system, and controls have been constructed.
- Well was disinfected to ensure no BACT contamination. Baseline sample indicated no BACT presence. Upon disinfection and purging, no BACT presence in 3 consecutive daily samples.
- Well has been connected to distribution and is being integrated into the water system.
- CS-12 has not started water production operations. Controls are being tested/calibrated. Requires TCEQ sampling.
- Will require monthly BACT samples for service life of well.



Future Supply Well CS-13

- CSSA is considering another potable supply well in the East Pasture.
- Initially will be drilled as an 8-inch test well and tested for yield and sampled for contamination.
- If well does not meet yield or water quality criteria, it will be completed as a Plume 1 monitoring well.
- If well does meet yield and water quality criteria, it will drilled to a larger diameter and permitted as a PWS well.

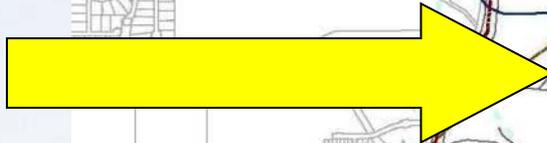




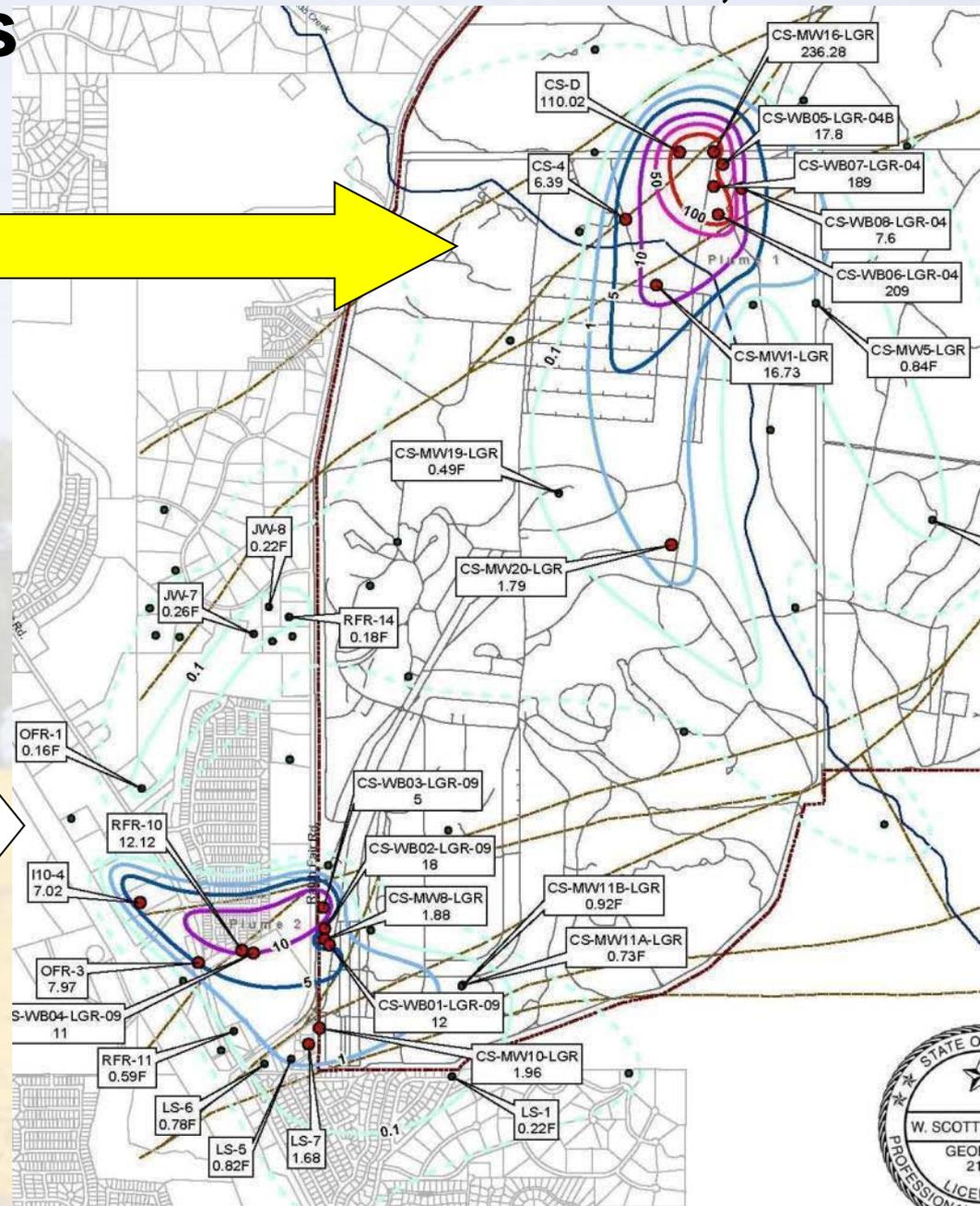
TREATABILITY STUDY UPDATES

CSSA Pilot Studies Description

1. SWMU B-3 Bioreactor Pilot Study:
 Enhanced anaerobic bioremediation of chlorinated hydrocarbons in underlying fractured limestone at Plume 1.



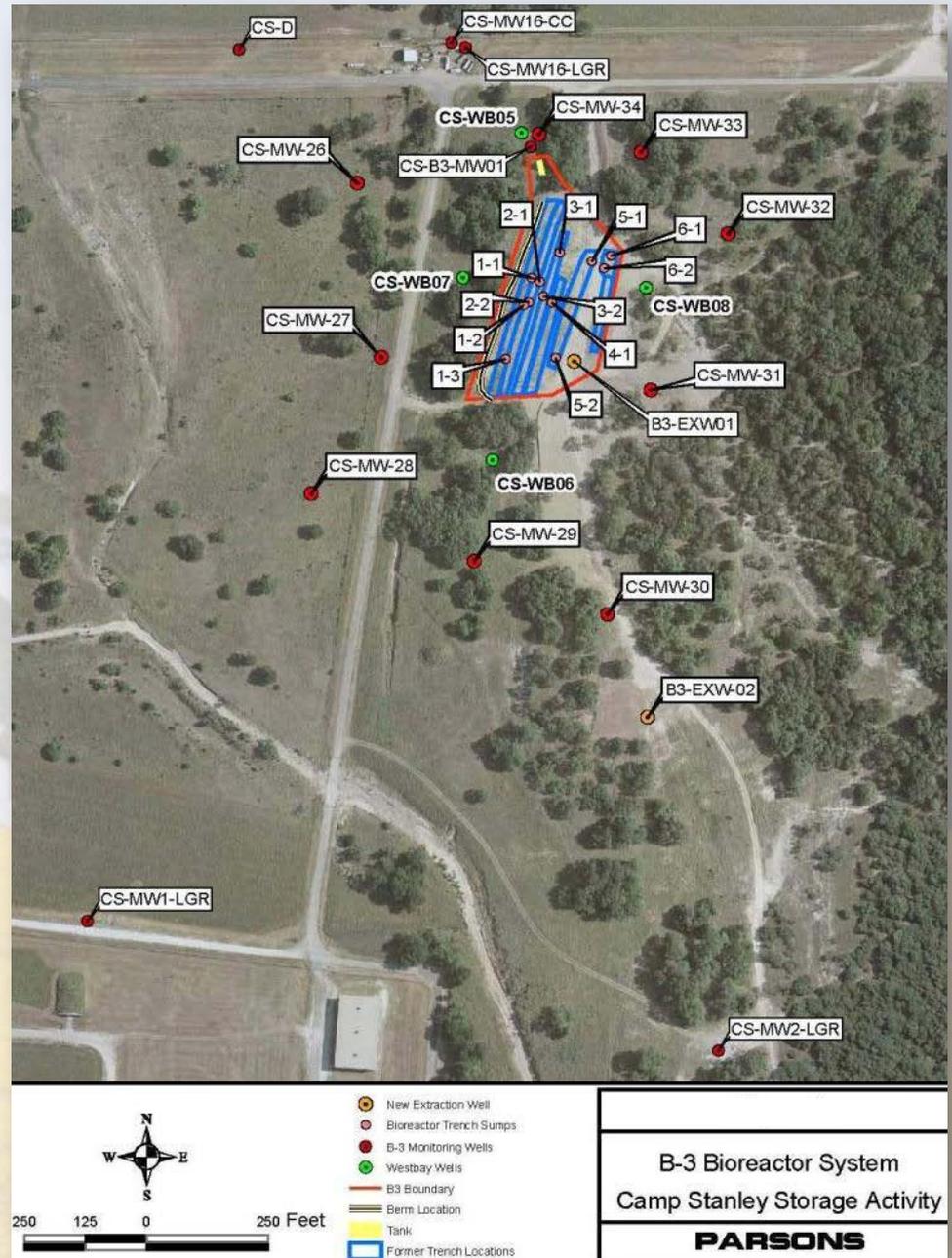
2. AOC-65 Soil Vapor Extraction Pilot Study:
 Removal of chlorinated hydrocarbons in underlying fractured limestone at Plume 2.



SWMU B-3

Background

- SWMU B-3 consists of 6 trenches operating from 1970's thru 1980's.
- Identified in 1995 as potential source of groundwater contamination at nearby supply well (well 16).
- ~15,200 CY waste excavated from SWMU B-3 and disposed off-post in 2006.
- Bioreactor initiated operations in 2007 under TCEQ UIC Authorization No. 5X26004321.



B-3 Bioreactor Pilot Study

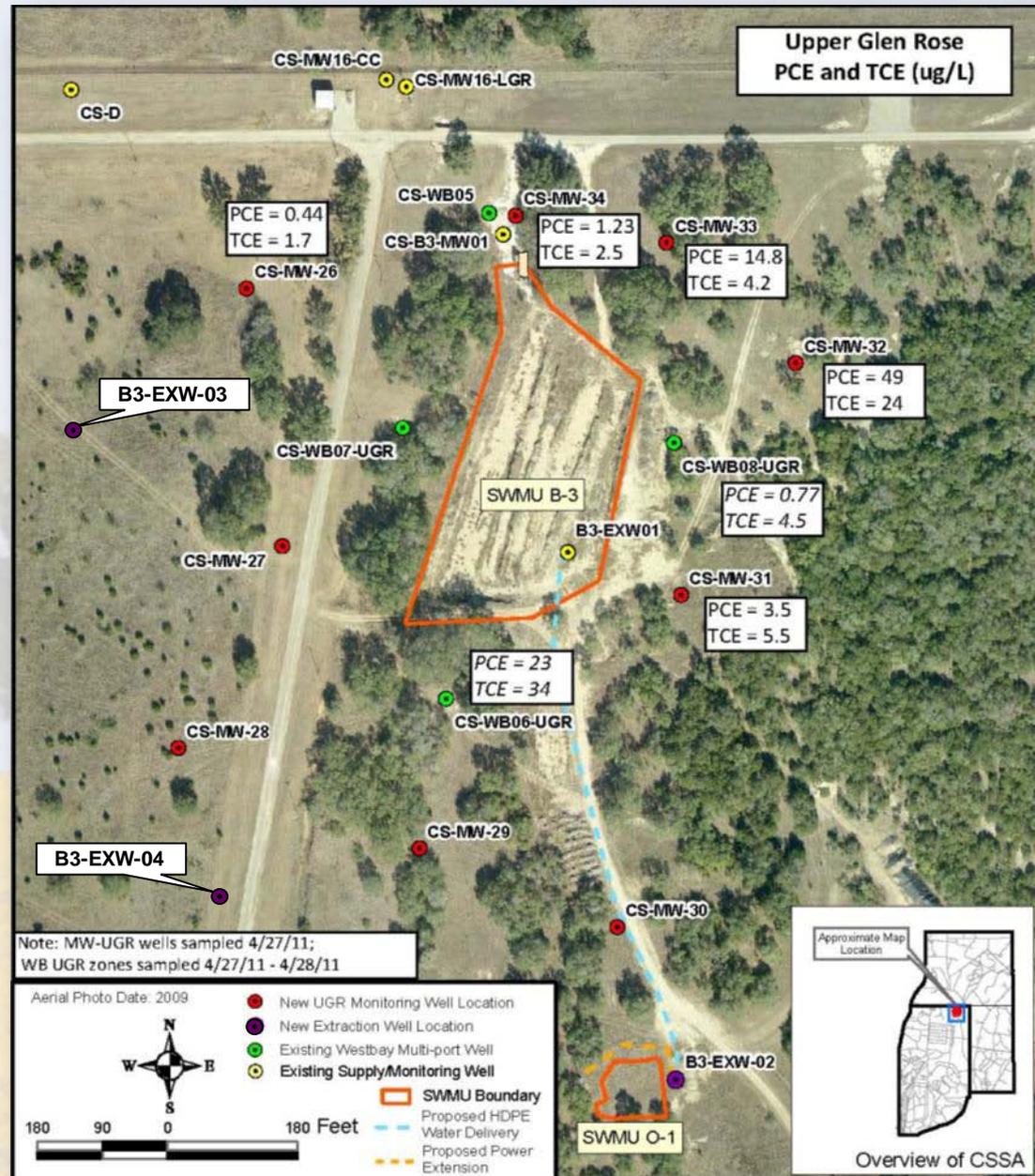
General Observations

- Bioreactor is effectively treating an average of 20,000 gallons of injected contaminated groundwater per day.
- Biotic degradation is occurring with biological degradation end products ethylene, ethane and CO₂ identified in surrounding UGR wells and LGR wells.
- Significant contamination likely remains in the fractured bedrock formation. Underlying CAH's are being flushed.



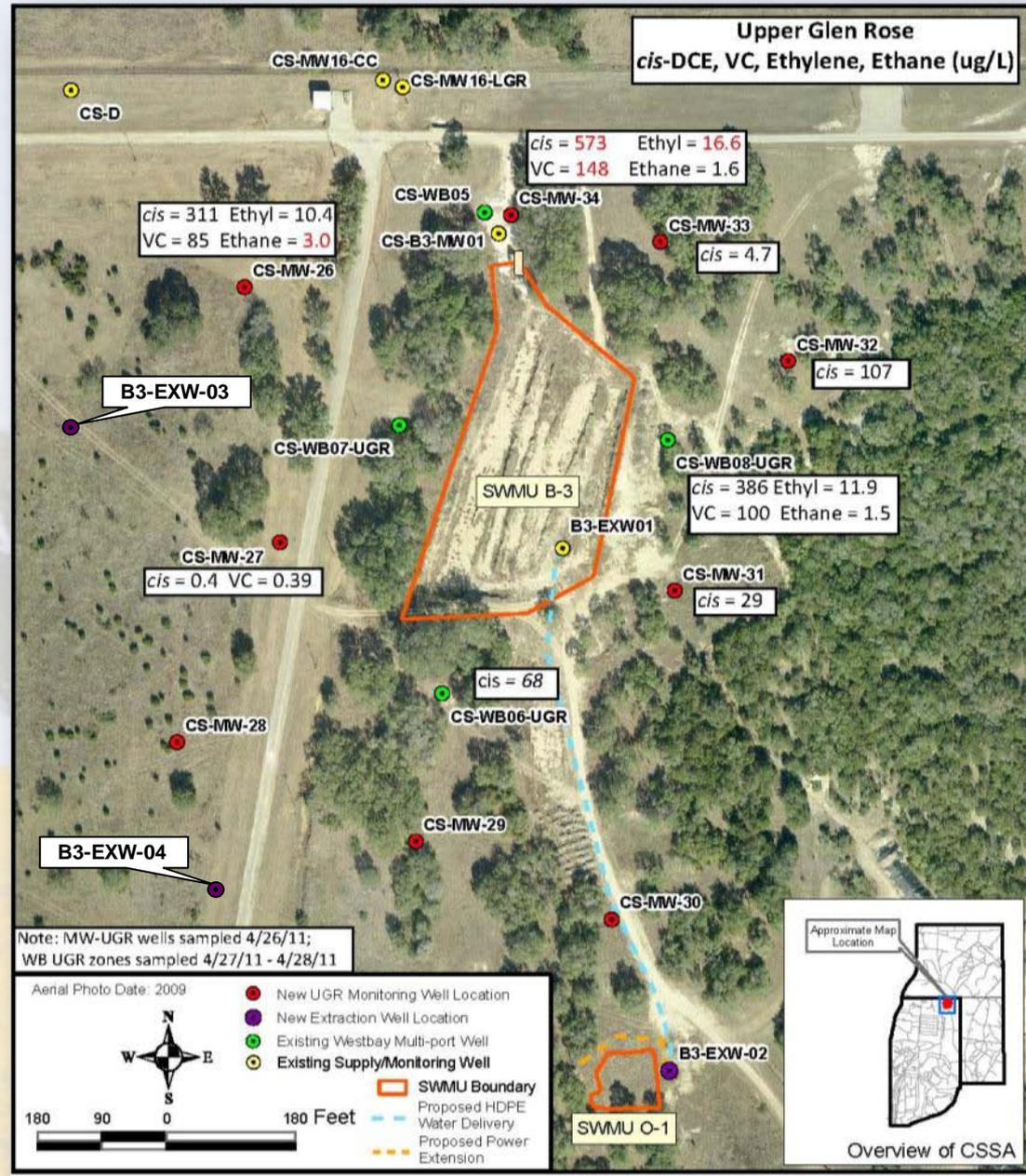
B-3 Bioreactor Pilot Study Observations

- Shallow wells south and east of the bioreactor contain elevated concentrations of PCE and TCE.
- Shallow wells to the west of the bioreactor continue to contain minor concentrations of PCE or TCE approximately equal to concentration levels in bioreactor.



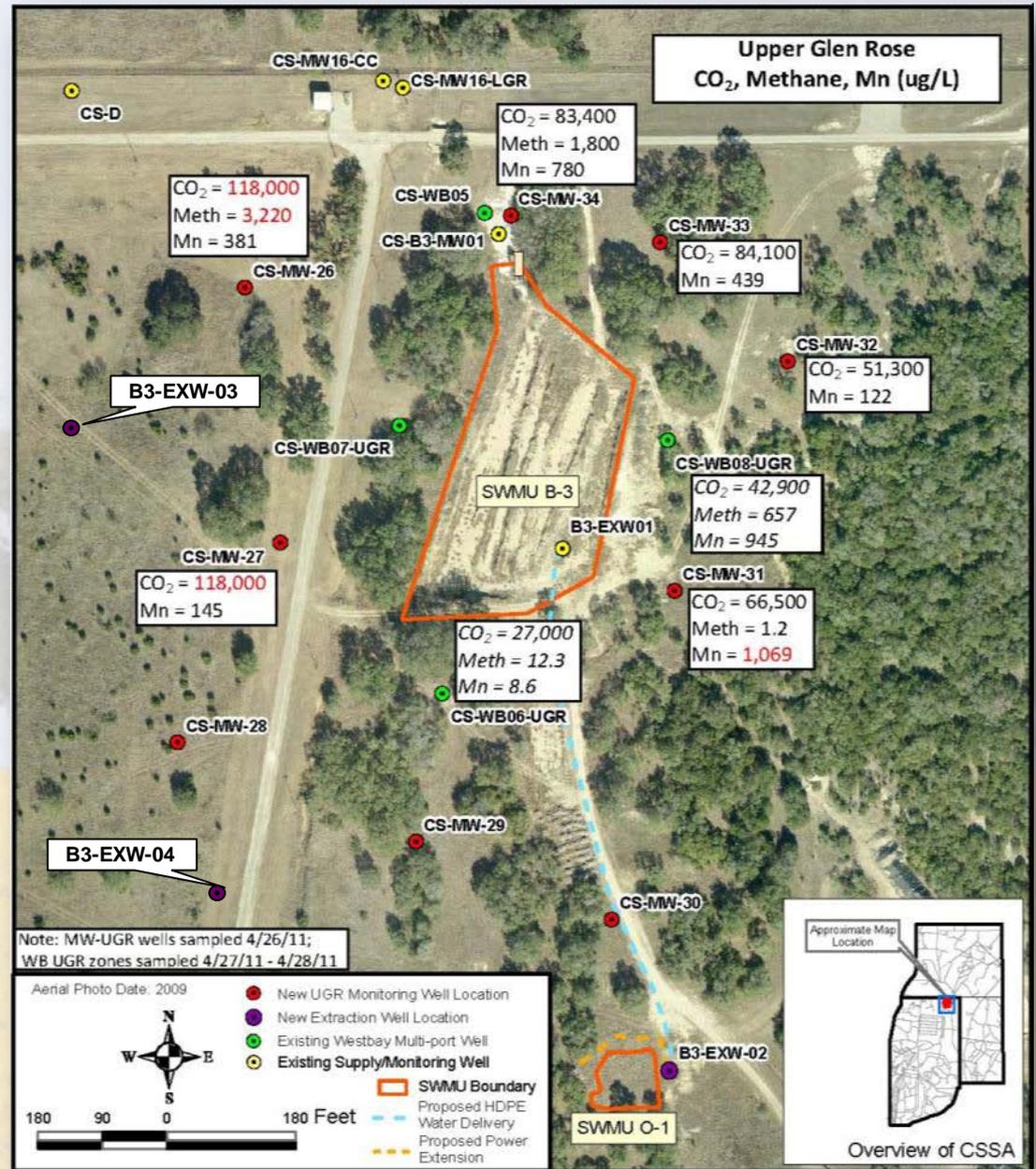
B-3 Bioreactor Pilot Study Observations

- Monitoring wells north and west of the bioreactor contain elevated concentrations of microbial degradation products vinyl chloride (VC) and ethylene (Ethyl) suggesting bioreactor influence.
- Shallow wells to the east of the bioreactor contain degradation compound concentrations of *cis*-DCE.



B-3 Bioreactor Pilot Study Observations

- Shallow wells surrounding the bioreactor contain elevated concentrations of other biotic degradation products Carbon Dioxide (CO₂), Methane (Meth) and Manganese (Mn).
- CS-MW-28 continues to be a dry well suggesting potential fault line somewhere southwest of SWMU B-3.



B-3 Bioreactor New Extraction Wells

- Two new LGR extraction wells are being drilled West of the Bioreactor to augment the system.
- **CS-EXW03-LGR** is a cased open hole in highly fractured zone (TD = 340' bgs).
- **CS-EXW04-LGR** is currently being drilled.



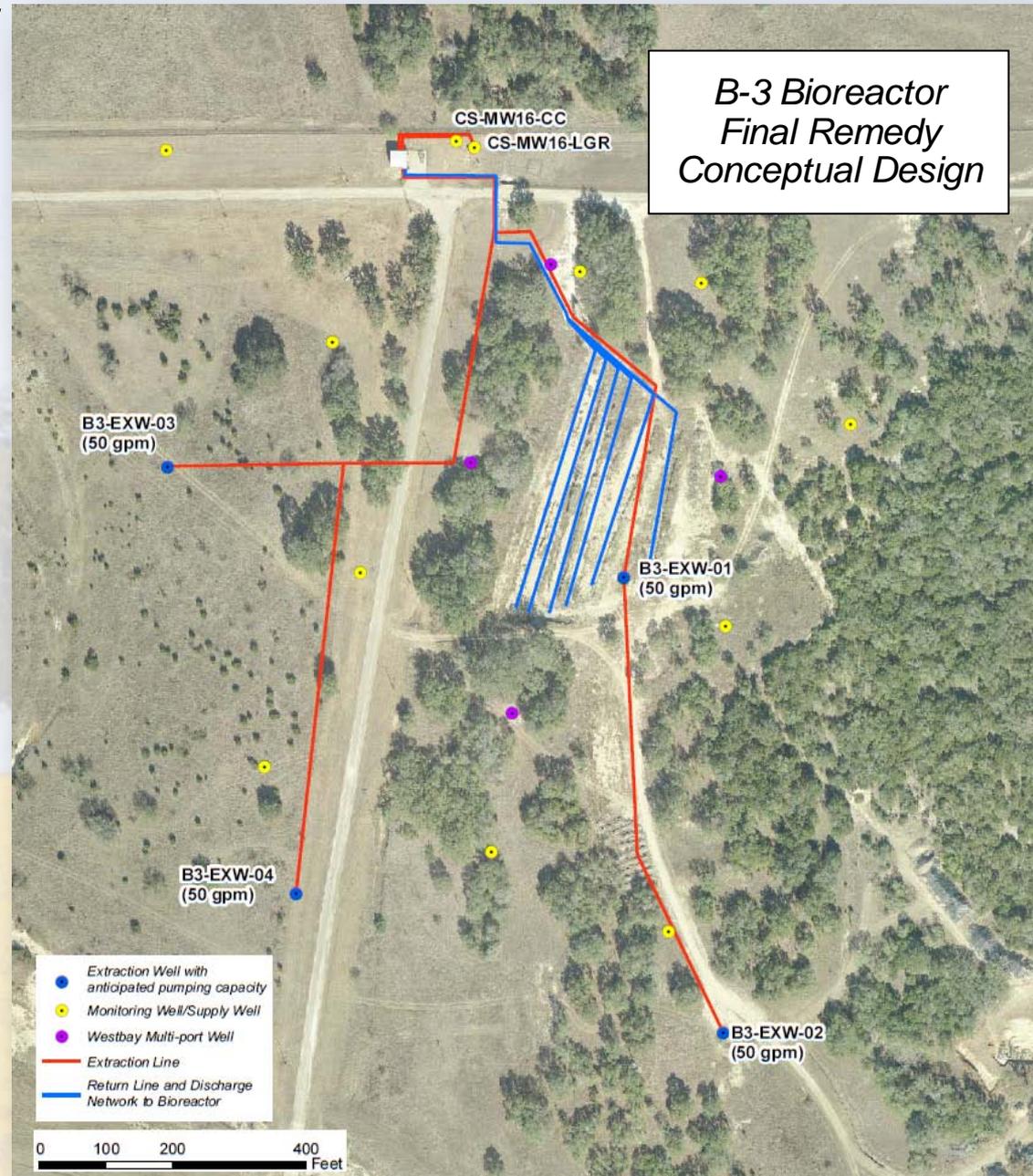
Replacement of CS-WB07

- Westbay well was damaged in March 2011 when probe and samplers broke off the wireline at 245' bgs.
- Probe was stuck, but was successfully extracted.
- Camera survey showed that the casing has been compromised.
- Water level inside the WB well has equilibrated with 03B zone.
- CSSA is funding extraction/replacement of WB07 this month.



SWMU B-3 Bioreactor Treatability Study Next Steps

- Continue monitoring bioreactor for UIC Permit and Performance parameters.
- Provide design for potential final remedy on SWMU B-3. Design includes new permanent tanks and delivery system with installation of SCADA control systems to allow remote data collection from wells and sumps.
- Repair WB07.



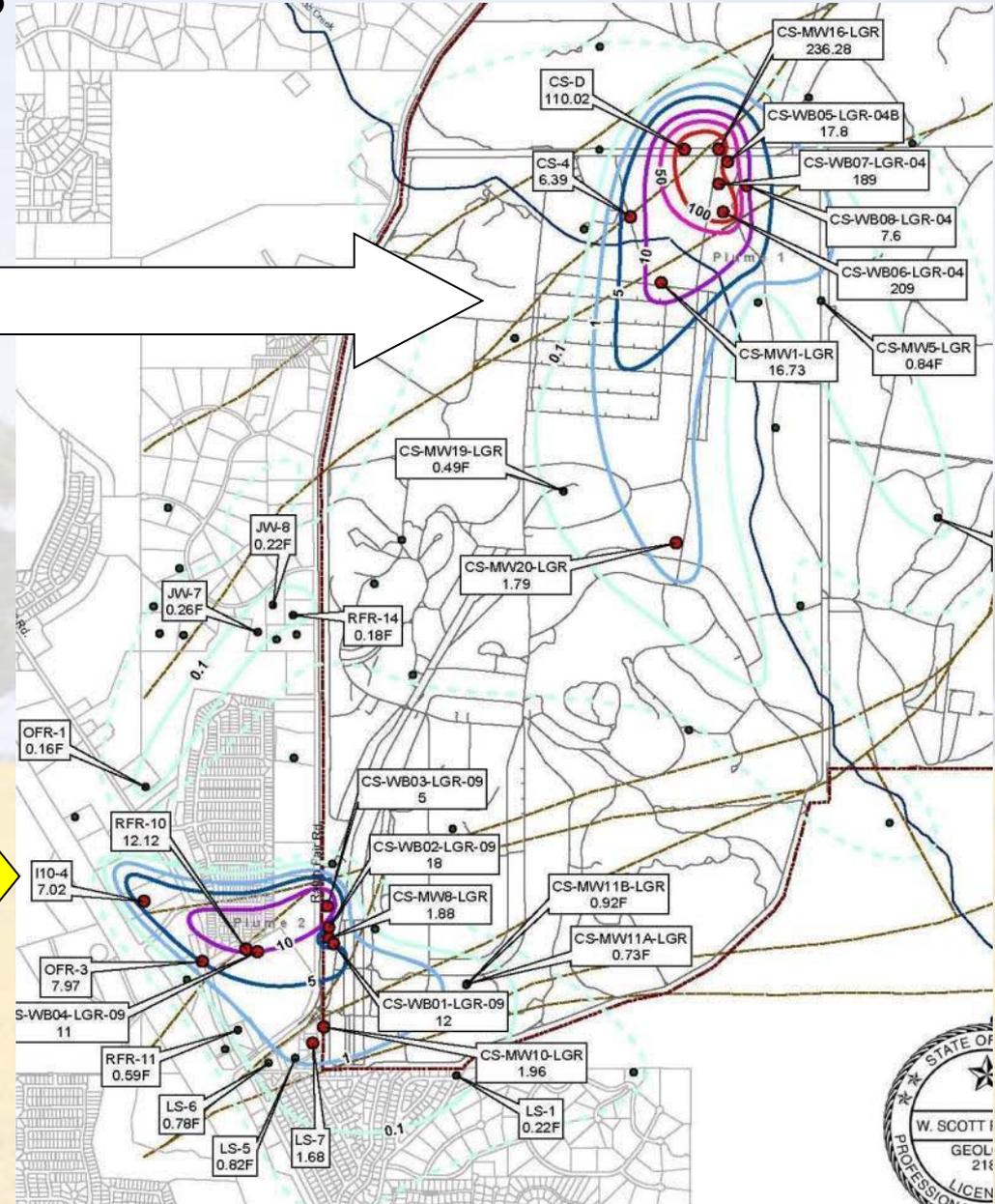
CSSA Pilot Studies Description

1. SWMU B-3 Bioreactor Pilot Study:

Enhanced anaerobic bioremediation of chlorinated hydrocarbons in underlying fractured limestone at Plume 1.

2. AOC-65 Soil Vapor Extraction Pilot Study:

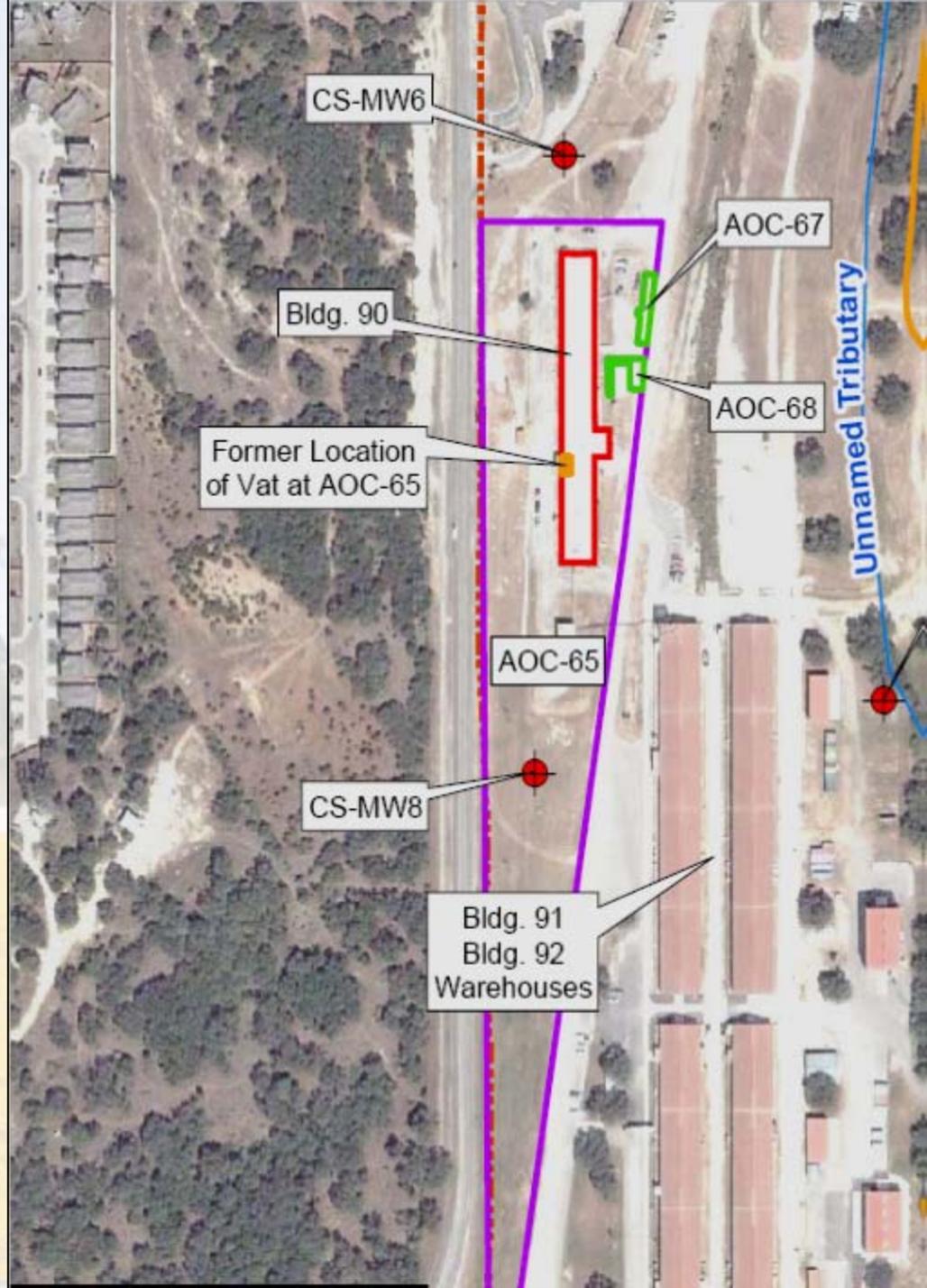
Removal of chlorinated hydrocarbons in underlying fractured limestone at Plume 2.



AOC-65

Background

- AOC-65 consists of an area surrounding Building 90.
- Operations included chlorinated solvent degreasing units (vats) which were removed in 1995.
- Initial investigations identified groundwater plume (2) in 1999.
- Interim Removal Actions in 2001 excavated and disposed ~ 1,300 CY of impacted soil media off-post.
- SVE Pilot Study initiated in 2002, which continues to operate within Permit By Rule Limits.



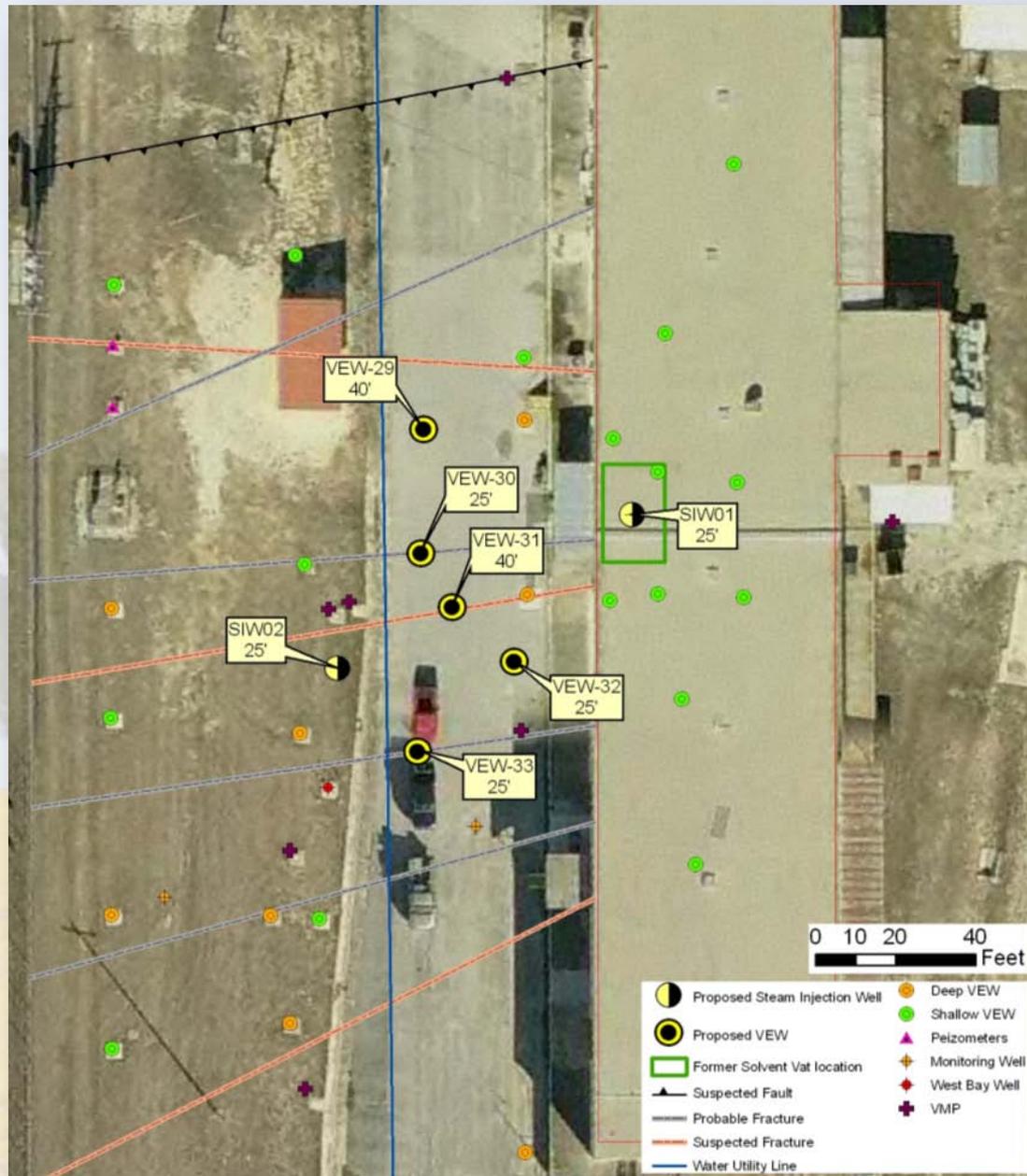
AOC-65 Treatability Study Objectives

Review and Summary

- Purpose: Determine if thermally enhanced SVE (using steam) is effective for removal of additional CVOC from the underlying limestone formation.
- Activities since February 2011 :
 - Installed 2 steam injection wells (SIW) and 5 Vapor Extraction Wells (VEW).
 - Upgrading SVE system.
- Activities planned through September:
 - Collect data to provide assessment of thermally enhanced SVE system operations.
 - Prepare SVE assessment report detailing pilot study results.
- Perform a source removal IRA for AOC-65 to potential remove contaminated limestone near ditch area west of Building 90.
 - Completing IRA design efforts and treatability assessment for utilizing oxidizing material within the trench.
 - Identify path forward for IRA remedial and pilot studies.

Treatability Study Updates SVE Enhancement

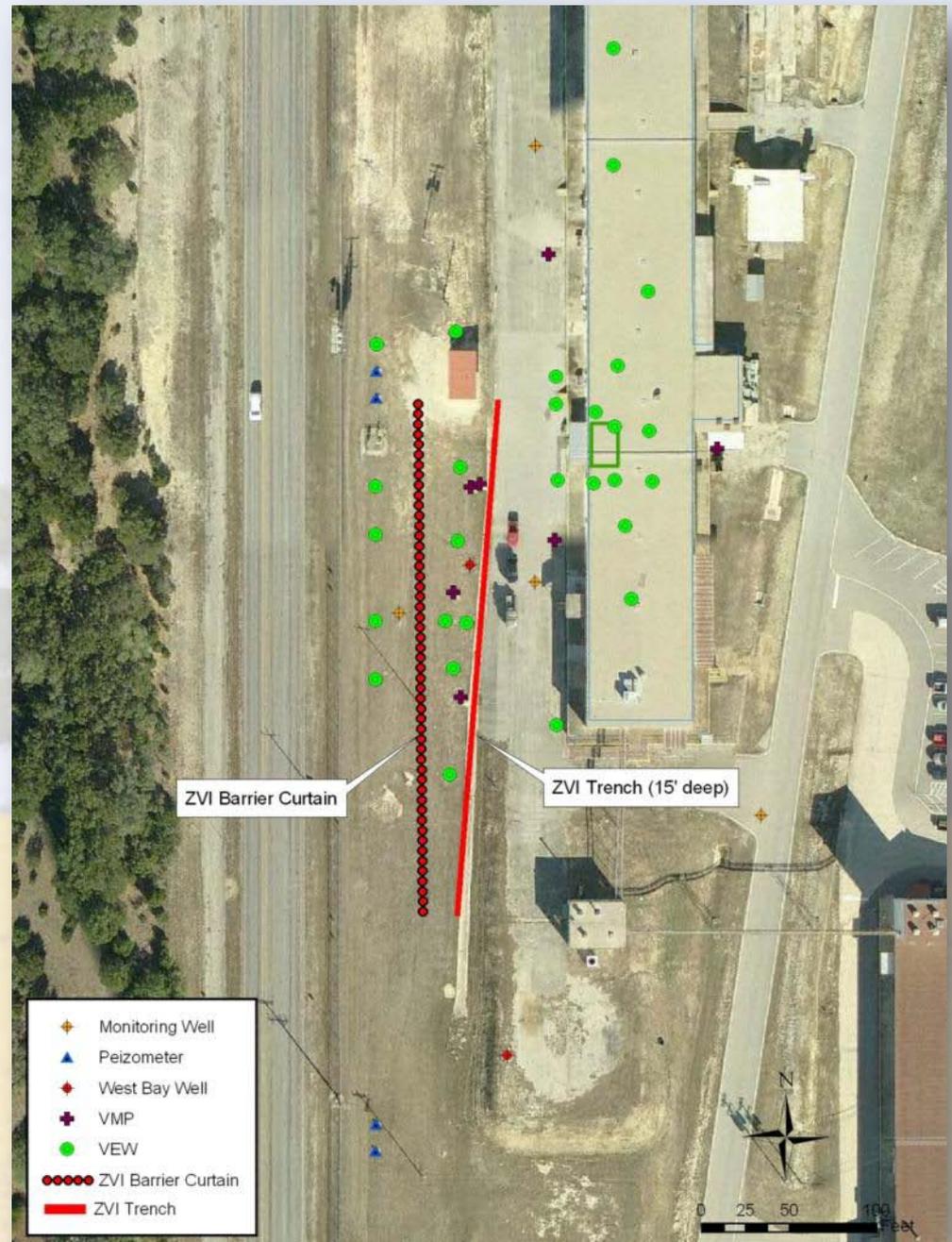
- During SVE upgrades identified water leak in the area. Source of leak currently unknown.
- In April 2000, 3.7 mg/kg PCE found in surface soil sample collected beneath the historical solvent vat.
- In April 2011, 290 $\mu\text{g/L}$ PCE found in groundwater sample.



AOC-65 Treatability Study Updates

Anticipated Future Interim Removal Action

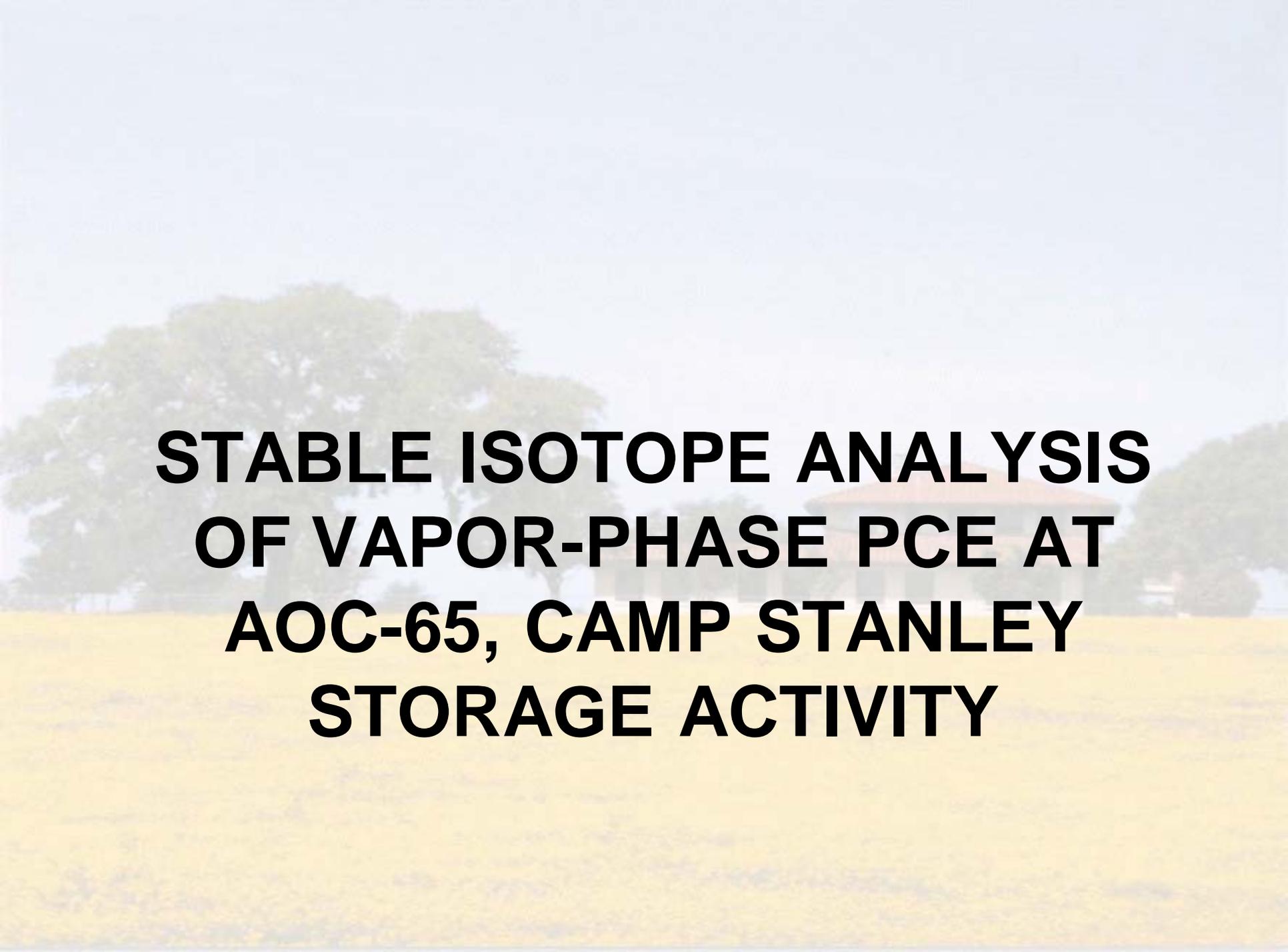
- IRA removing potentially contaminated soils and bedrock west of Building 90 within the ditch area.
- Approximate dimensions of trench will be 300 ft in length, 3 ft in width and up to 15 ft in depth (aerial photo at right).
- Oxidizing material anticipated to include zero valent iron filings operating as a permeable reactive barrier.



AOC-65 Treatability Study

Next Steps

- Continue monitoring SVE system to determine effectiveness of treating source area.
- Conduct pilot-scale study for Steam Enhanced Extraction on AOC-65 source area.
- Repair water line leak and include findings in SVE assessment report upon completion of the steam enhanced extraction pilot study
- Complete Engineering plan for IRA at AOC-65 to remove potential source area near ditch line.
- Continue investigation/evaluation of other potential treatment options for AOC-65 and Plume 2.

The background of the slide is a photograph of a rural landscape. In the foreground, there is a field of yellow flowers, possibly sunflowers. In the middle ground, there are several green trees and a building with a red roof. The sky is a pale, overcast blue.

**STABLE ISOTOPE ANALYSIS
OF VAPOR-PHASE PCE AT
AOC-65, CAMP STANLEY
STORAGE ACTIVITY**

● Vapor sample (May 2011)

■ Groundwater sample (July 2010)

● AOC65-VEW21

● AOC65-VEW10

● AOC65-VEW28

UGR
and
LGR-09

■ WB-03

● AOC65-VEW12

● AOC65-VEW27

● AOC65-VEW25

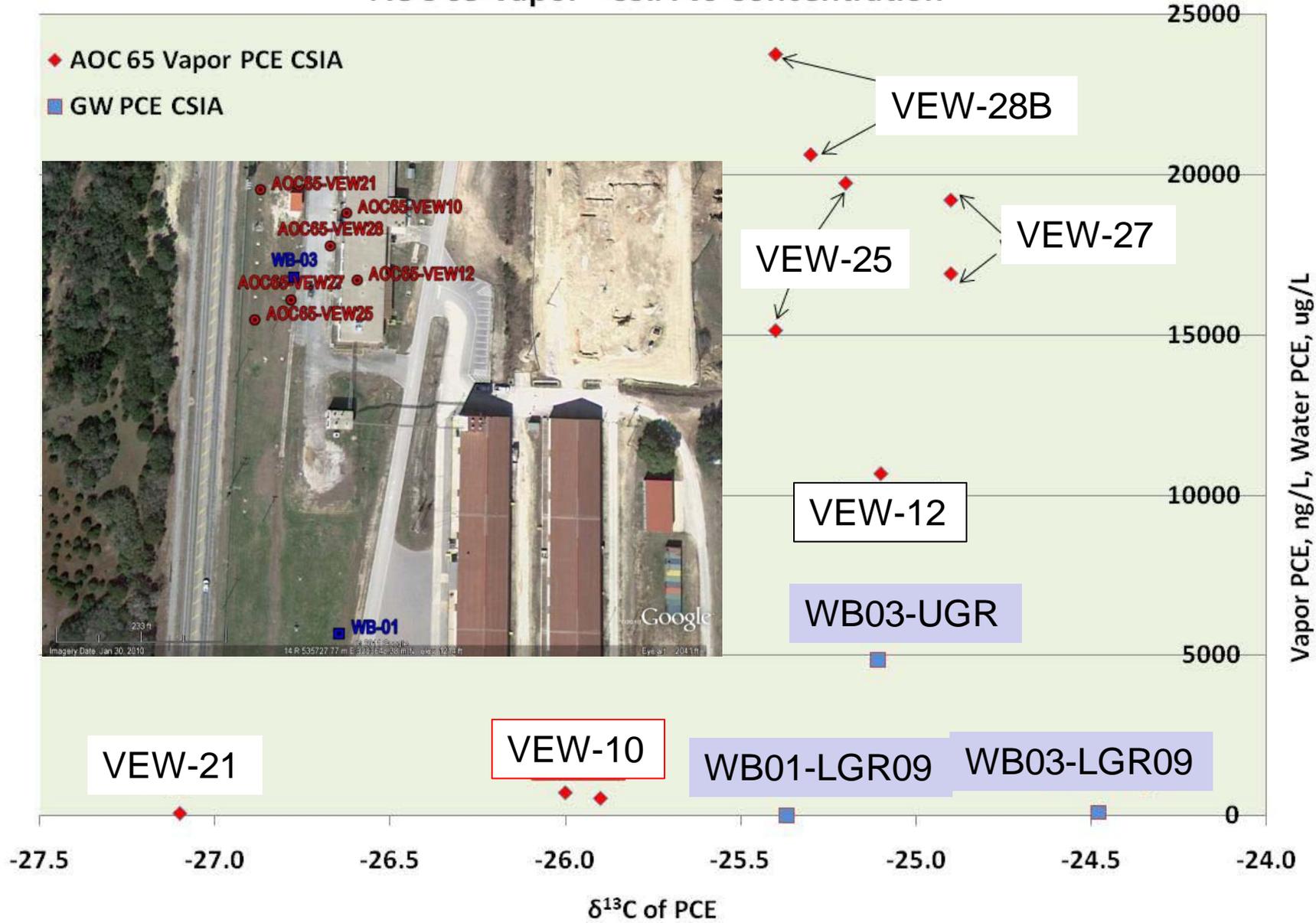
WB01-LGR09 – 407 ft
south of Bldg. 90

82 ft

©2010 Google

AOC 65 Vapor - CSIA vs Concentration

- ◆ AOC 65 Vapor PCE CSIA
- GW PCE CSIA

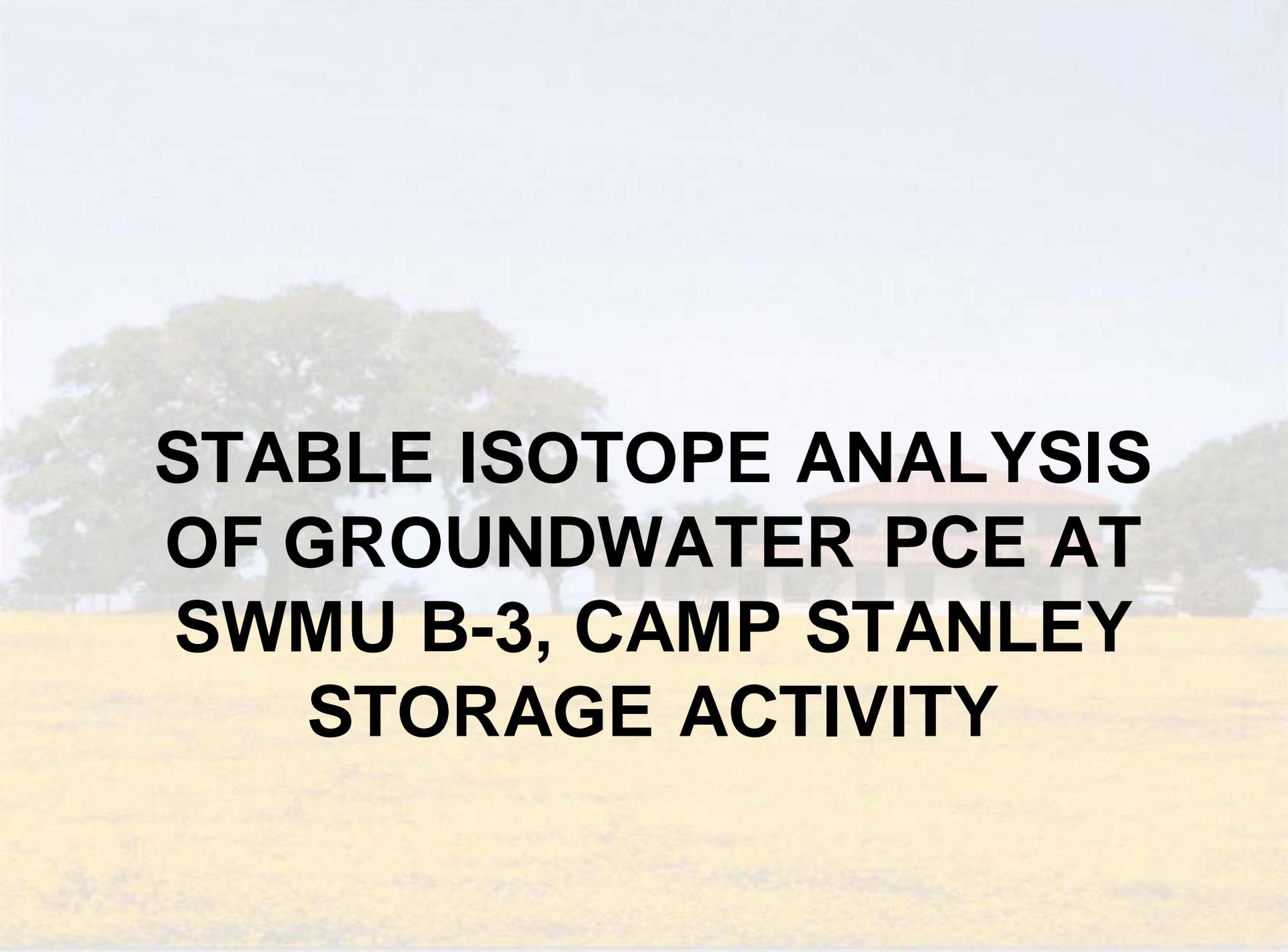


Transport Analysis Results: Stable Isotopes of Vapor PCE

- Stable isotope signatures of PCE in VEW-25, -27, and -28B match those of VEW-12
 - PCE vapors migrated from VEW-12 area along at least two pathways
- Stable isotope signature of PCE from VEW-10 does not match any other sample
 - If PCE is migrating from VEW-10 in the vapor phase, we have not located a pathway
- Signature of PCE from VEW-21 does not match signatures from Bldg. 90 (VEW-10 or VEW-12) or any other sample. It may not be accurate as another unknown chemical co-eluted with PCE.

Transport Analysis Results: Stable Isotopes of Vapor PCE (*conc.*)

- PCE in groundwater from wells WB01-LGR09 and WB03-UGR has same signature as vapor-phase PCE from VEW-12
- PCE in groundwater from WB03-LGR09 has most enriched signature, which may result from degradation of PCE or yet another PCE source

The background of the slide is a faded, light-colored photograph of a rural landscape. It features a large, leafy tree on the left side, a building with a reddish-brown roof in the middle ground, and a yellow field in the foreground. The overall scene is bright and slightly hazy.

**STABLE ISOTOPE ANALYSIS
OF GROUNDWATER PCE AT
SWMU B-3, CAMP STANLEY
STORAGE ACTIVITY**

Transport Analysis: Stable Isotopes of Water (July 2010)

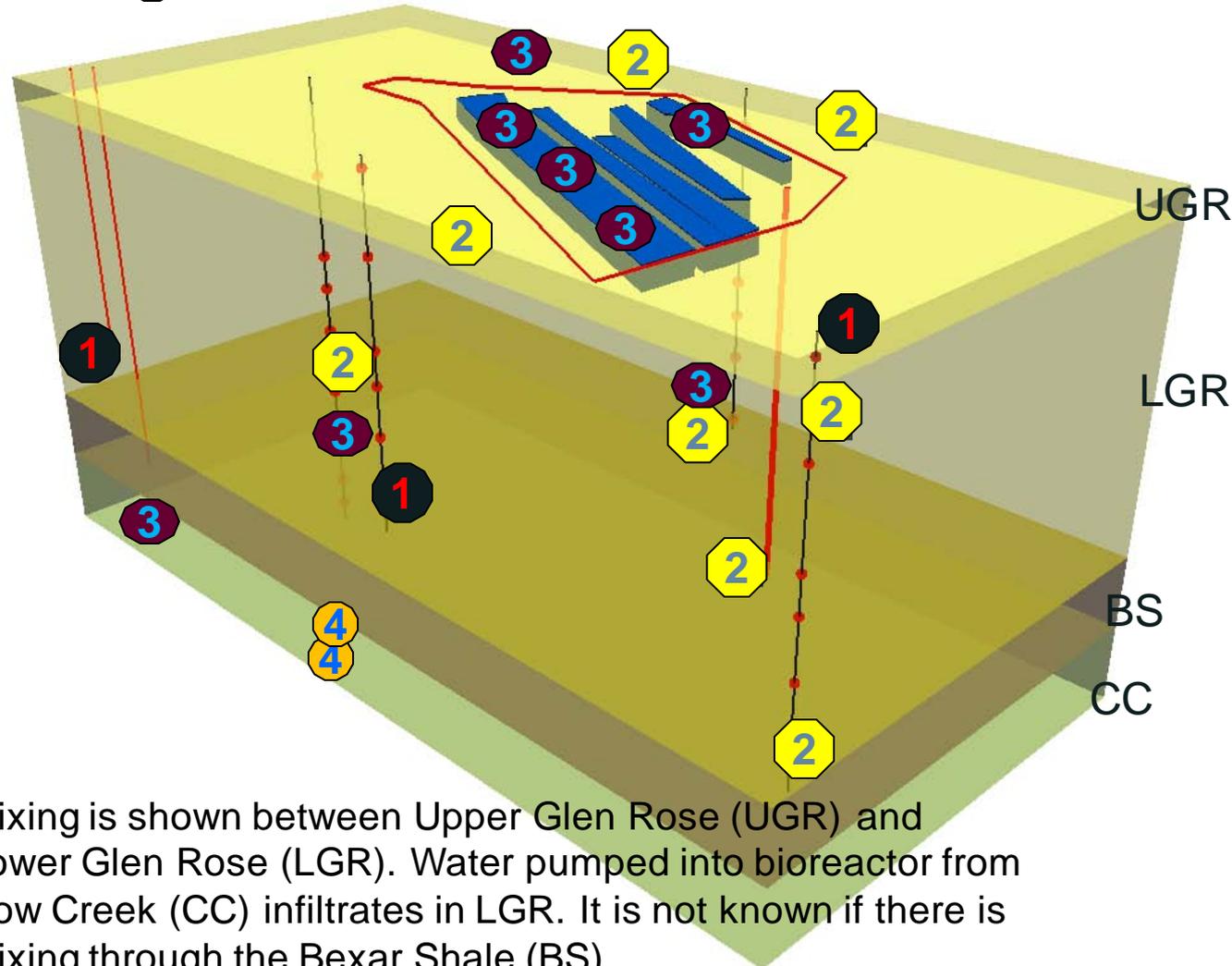
Water samples were collected in the field and analyzed for $\delta^{18}\text{O}$ and $\delta^2\text{H}$ isotopic signatures.

Four groups with unique water signatures were classified (indicated in the diagram).

Groundwater groups, from (1) most enriched (heavier) to (4) most depleted (lighter) water molecules.

CS-D: 1

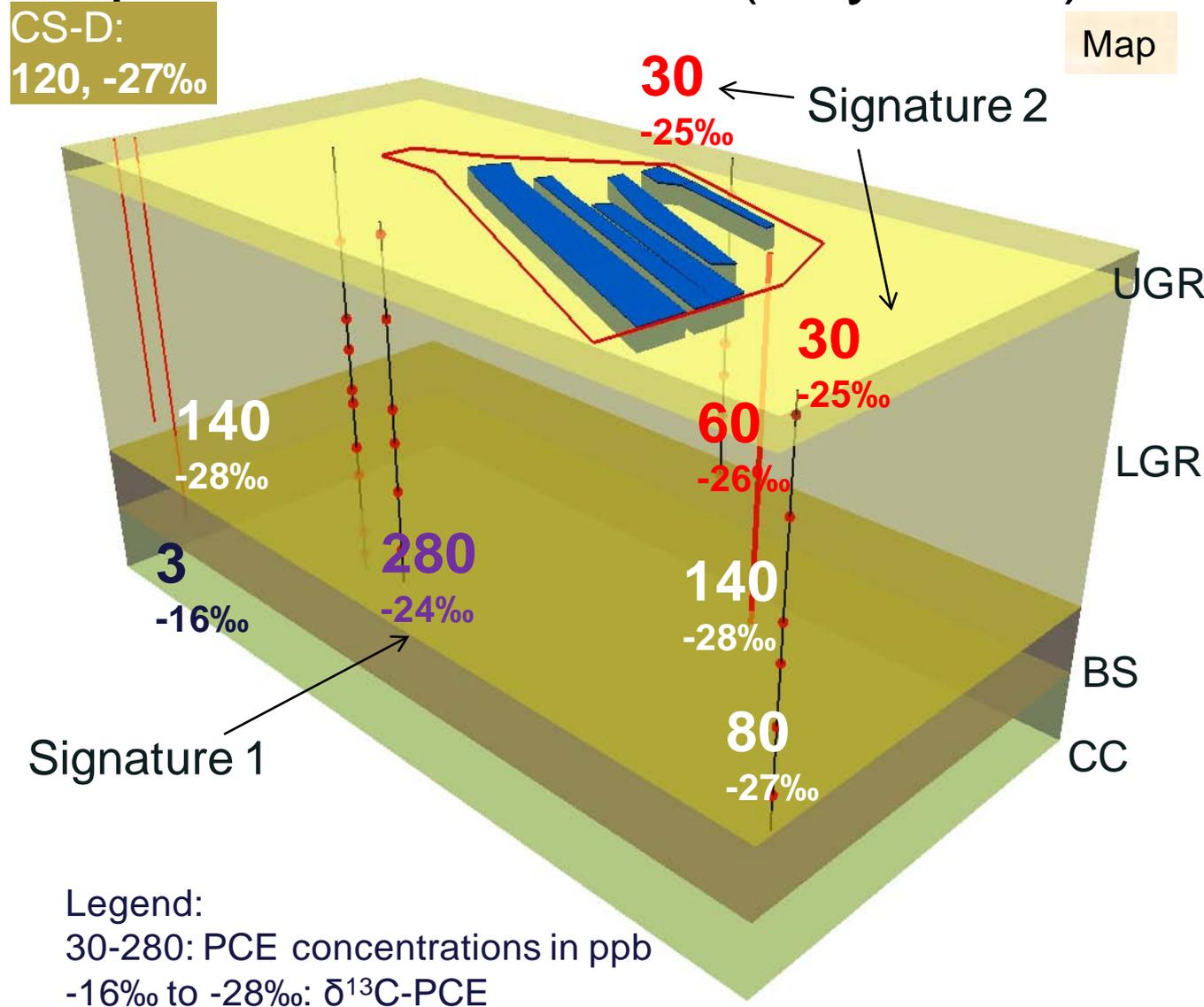
Map



Mixing is shown between Upper Glen Rose (UGR) and Lower Glen Rose (LGR). Water pumped into bioreactor from Cow Creek (CC) infiltrates in LGR. It is not known if there is mixing through the Bexar Shale (BS).

Contamination at SWMU B-3: Concentrations and stable isotopes of carbon-PCE (July 2010)

- Concentrations of PCE highest west of the bioreactor just above the BS
- The area with highest PCE concentration (WB07-LGR4) has a $\delta^{13}\text{C}$ -PCE of -24‰ indicating isotopic fractionation, probably due to degradation



Recommendations

- To maximize contaminant removal:
 - Construction of new extraction wells to remove suspected areas of PCE
- To maintain/optimize performance of the bioreactor:
 - Monitor the bioreactor after rainfall. May need to add electron donors such as acetate or lactate to maintain microbial populations. Keep pumping water to prevent drying.

Recommendations (*conc.*)

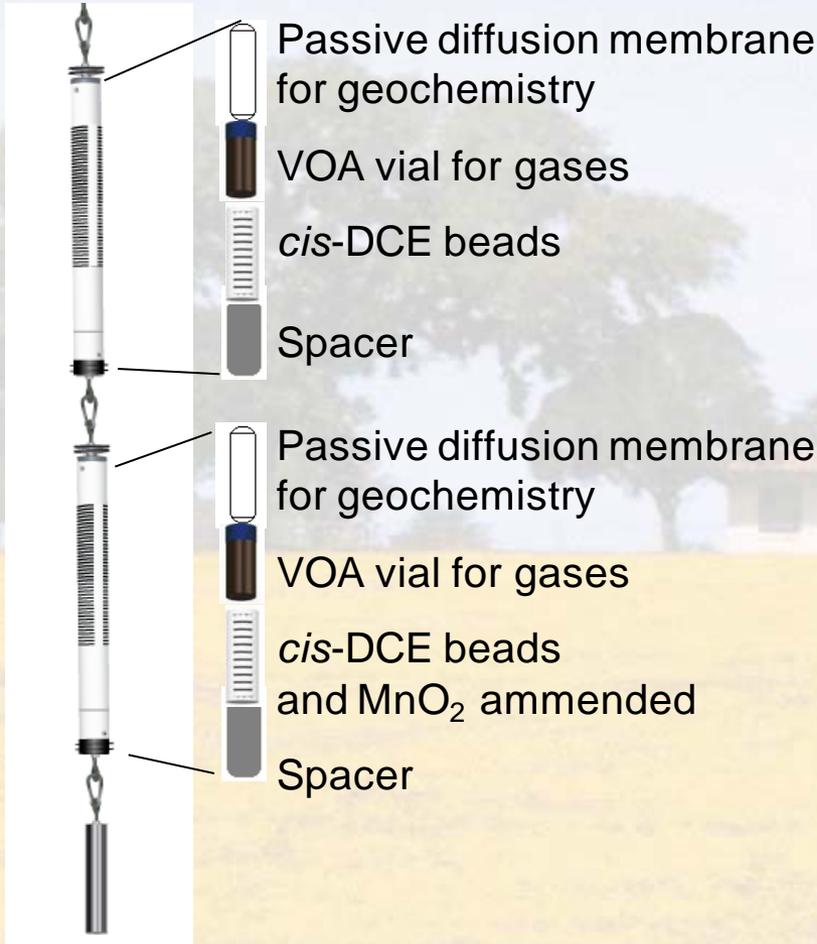
- To reduce overall cost:
 - Reduce target analyte list and monitoring frequency, consistent with regulatory requirements, to the following parameters:
 - Dissolved organic carbon
 - Volatile fatty acids
 - ORP and pH
 - Mn, Fe[II], other metals if required for regulatory purposes
 - Sulfate
 - Hydrogen sulfide
 - Methane, ethene, ethane
 - Microbial community
 - Suggest direct injection of lactate into wells to reduce cleanup time. Regulatory limitations for this approach.

Bio-Trap Study in Trench 1 SWMU B-3

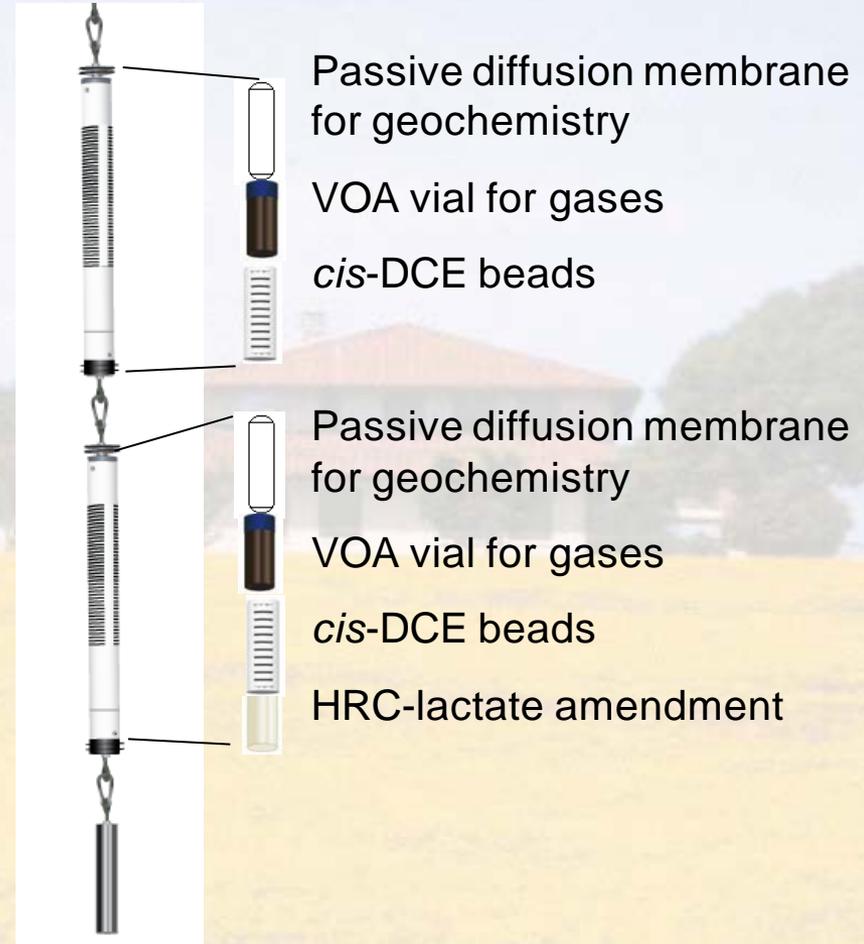
- Purpose: To determine which degradation pathway is more efficient in degrading *cis*-DCE.
- Pathways:
 - Oxidation of *cis*-DCE coupled to manganese reduction
 - Reductive dechlorination enhanced with lactate as an electron donor

Bio-Trap Study in Trench 1 SWMU B-3 (*conc.*)

T1-3



T1-2





- Bioreactor trenches
- Sampling points in Trench 1
- Monitoring wells
- Extraction wells

Miscellaneous Topics

- Future public meeting

