

Meeting Minutes

Subject: Environmental Program Status Update
Date: February 18, 2010
Time: 9:30 am – 3:30 pm
Place: Camp Stanley Storage Activity, Boerne, Texas

Attendees:

Name	Organization	Telephone
Glaré Sanchez	CSSA	sanchezg@envirodept.net
Ken Rice	Parsons	Ken.rice@parsons.com
Julie Burdey	Parsons	Julie.burdey@parsons.com
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Adrien Lindley	Parsons	Adrien.lindley@parsons.com
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Scott Pearson	Parsons	William.scott.pearson@parsons.com
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Mike Chapa	Weston	Mike.chapa@westonsolutions.com

Topic Discussed:

1. Update on Investigations & Interim Removal Actions

- a. **SWMU B-4** (slides: WESTON_TI_Briefing_SWMU B-4_Proposed Approach_021210.ppt). Russ Cason (Westin) gave an overview of previous investigations at the site. He outlined the interim removal action planned including: collection of surface soil samples to determine COC concentrations and extent; exploration of trenches to determine extent and confirm Target COC list (Phase I); and conducting removal action to clean up site to Tier I or Tier 2 PCLs (Phase II). Field work for soil sampling to begin in 2 weeks, Phase I at the end of March, and Phase II, 30 – 45 days after in mid-summer.

Discussions on high mercury detection of previous soil sample which was also found in the blank. Ken Rice (Parsons) found elevated mercury levels at B-7 also.

- b. **AOC-67 and AOC-68** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Ken Rice gave background overview and status update for the AOCs. He explained how the sites meet requirements for no further action and how the impacted soil lining of the compressed air line to Building 90 is being removed from AOC-68 and placed within AOC-65.
- c. **SWMU B-15/16** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Ken Rice gave the status update for SWMU B-15/16. Timeline for fieldwork to start is first part of March, pending coordination of UXO personnel.
- d. **SWMUs B-2 and B-8** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Ken Rice gave the status update for SWMUs B-2 and B-8. Grid sampling to determine extent of remaining lead-contaminated soils expected to will begin in April. The sampling plan is to cast a wide net with sampling effort to make sure all the problem areas are included.

2. **Update on Groundwater Investigations** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Scott Pearson gave an overview and update of the groundwater monitoring efforts at CSSA including a discussion on: the long-term monitoring plan and objectives; the 5 off-post GAC units; the off-post wells I10-4 and I10-7 sampling results; and the new drinking water supply well –CS-12.

3. **Public Meeting Recap** (no slides). Julie Burdey gave an overview of the two CSSA public meetings held in the fall, 2009. A total of eight residents and three local officials attended. Issues raised included groundwater concerns and a request for clearer fact sheets.

Decision: Next set of public meetings will be held 2013.

4. Update on Investigations & Interim Removal Actions (continued)

e. AOC-63, AOC 64, SWMU B-71 (slides: 18Feb2010.ppt). Mike Chapa (Weston) outlined the status of the AOCs and the SWMU. Weston questioned need for new well down-gradient of site.

Decision: Both Greg Lyssy (EPA) and Sonny Rayos agree that it is sufficient to include in the APAR that a facility-wide monitoring network is in place and will be used for the long-term monitoring effort for the site. Both also agree that one APAR is sufficient for both AOC 64 and SWMU B-71.

- 5. SWMU B-3 Treatability Study Update** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Adrian Lindley (Parsons) gave an overview and update on the SWMU B-3 Bioreactor. Recommendations from Parsons included adding an additional extraction well for bioreactor injection, add eight additional shallow (35ft) piezometers to evaluate the extent of contamination in the vadose zone and help identify the bioreactor's influence, and conduct a tracer study within the bioreactor trench 6 (done). Adrian also discussed the results of the tracer study.

- 6. AOC-65 Treatability Study Update** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Ken Rice (Parsons) gave the overview and update on the treatability study. Next steps include determining effectiveness of thermally-enhanced SVE (using steam) and performing a Technology Assessment to identify other potential remedial options. Ken explained how Parsons is working on a white paper the potential of vapor intrusion. They are planning to collect soil gas samples at the soil/limestone interface. They are working towards an April deadline for the paper. Greg Lyssy (EPA) thought this was a good plan.

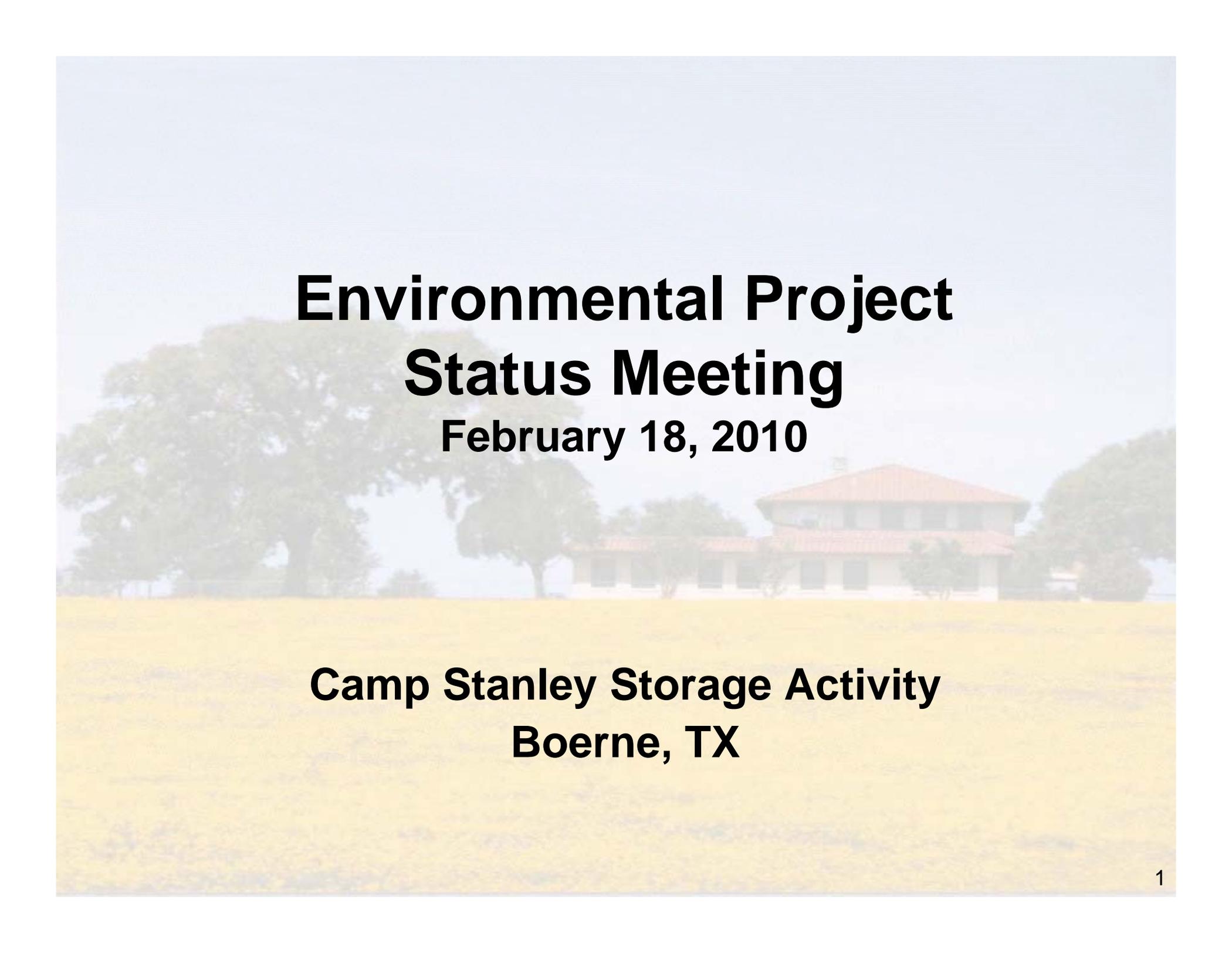
- 7. North Pasture Sites** (slides: Feb 18 2010 Reg Mtg (Final).ppt). Julie Burdey (Parsons) outlined the background of investigations at SWMU B-20/21 and B-24. CSSA is looking at the possibility of a removal effort at SWMU B-20/21, and Parsons is proposing to conduct a treatability study to focus the scope of work for such an effort. Discussions ensued regarding the possibility of breaking up the 35-acre site into manageable parcels that can be closed independent of the rest of the site.

Decision: Sonny Rayos suggested that a Response Action Plan be submitted for prior approval before the field effort begins. That way there is agree assurance of how the site portions can be closed. Parsons will finalize the technology assessment from 2009, plan the treatability study, and draft the response action plan.

8. Next Meeting Date

Decision: Next meeting date will be late May/early June timeframe.

- 9. After the meeting, a number of the attendees visited the some of the above project sites.**



**Environmental Project
Status Meeting
February 18, 2010**

**Camp Stanley Storage Activity
Boerne, TX**

Agenda

Status of Site Investigations

Weston Status: B-4

Parsons Status: AOC-67/68, SWMU B-15/16, B-2 & B-8

Groundwater Monitoring Update

Public Meeting Recap

Status of Site Investigations

Weston Status: AOC-64 & SWMU B-71

Treatability Studies Update

SWMU B-3 Status

AOC-65 Treatability Study/Vapor Intrusion Update

North Pasture sites

SWMU B-20/21 and B-24



STATUS OF SITE INVESTIGATIONS UPDATE

Status of Site Investigations

AOC-67/68

Sites are next to each other, and adjacent to Building 90.

- AOC-67: located west of Bldg. 90-1 and includes unlined ditch area and wastewater tank removed in 1997.
- AOC-68: located in area near Bldg 90-2 and includes the unlined ditch to the west.



Building 90-1 Former location of CSSA bluing facility

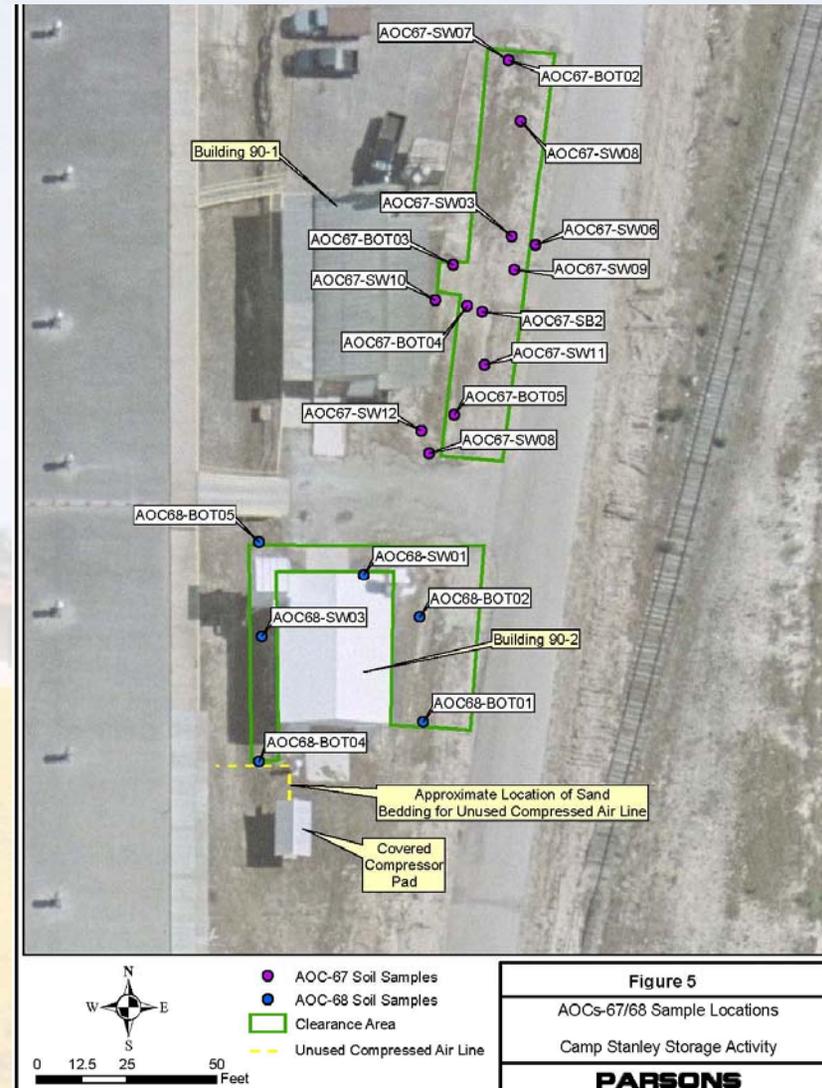


Building 90-2 Location of abrasive cleaning "Wheelabrator" facility

Status of Site Investigations

AOC-67/68

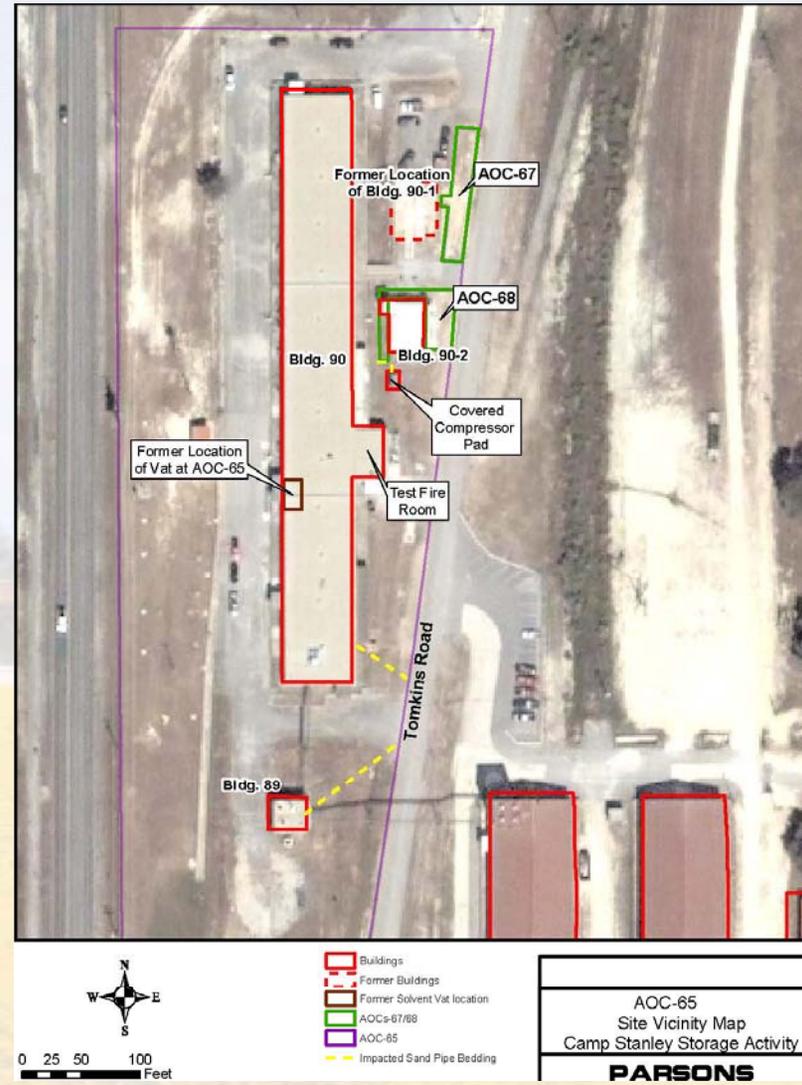
- Sites meet requirements for no further action.
- Investigations near AOC-68 uncovered metals (lead and cadmium) impacted sand pipe bedding underlying a compressed air line.
- Draft RIR under review by CSSA, anticipate submittal in March 2010.



Status of Site Investigations

AOC-67/68 & AOC-65

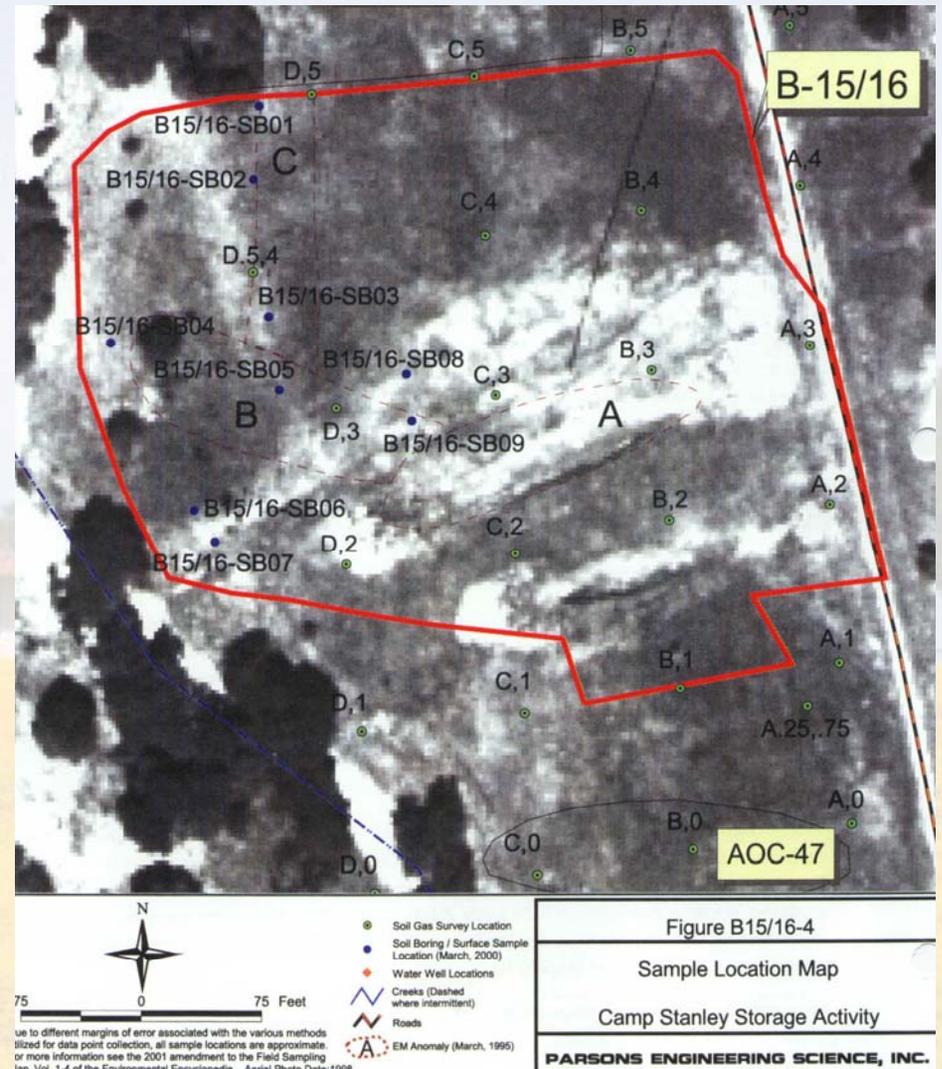
- Additional impacted sand bedding identified underlying wastewater piping near Bldg. 89 and Bldg. 90.
- Manhole Survey conducted as part of sanitary sewer rehabilitation project found no impacted bedding material.
- Impacted sand bedding at AOC-65 to be addressed in an upcoming project.



Status of Site Investigations

SWMU B-15/16

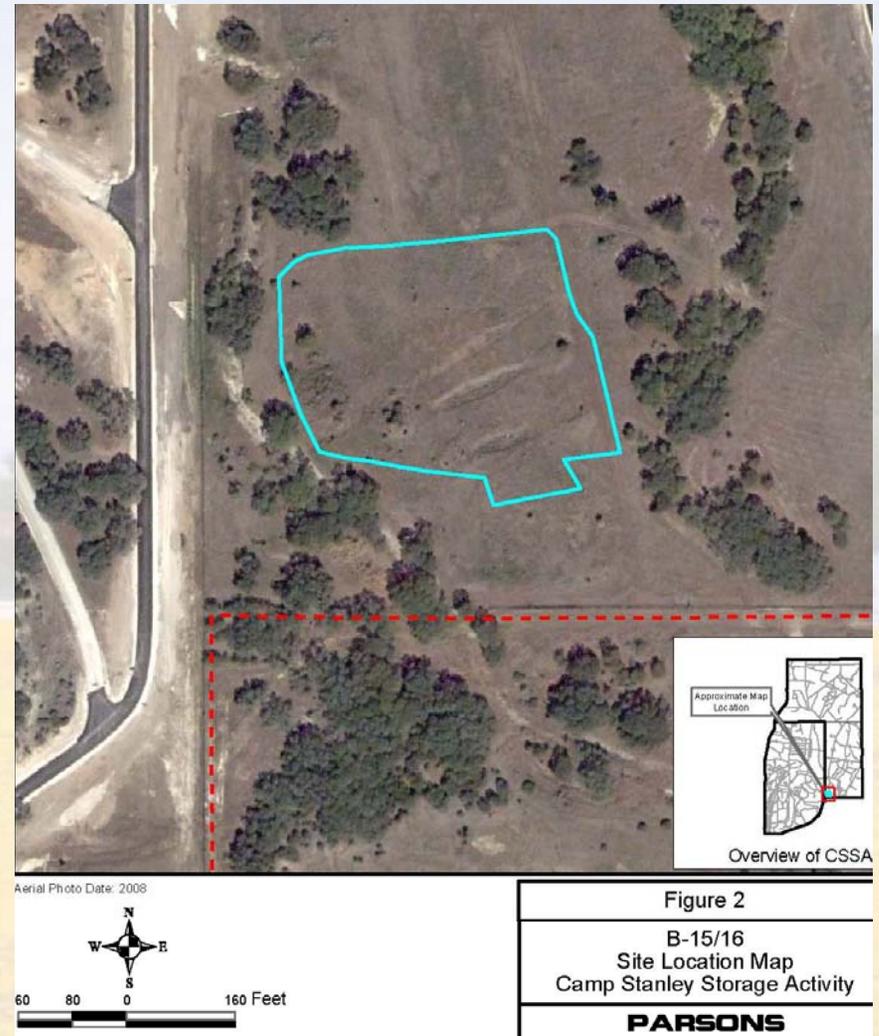
- SWMU B-15/16 was reportedly used as landfill areas for the disposal of target vehicles and weapons mounts. Visible metal debris, including vehicle parts, are present in the landfill areas.
- Previous analytical results of investigation samples indicate soil media COC as Cu which is slightly above background.



Status of Site Investigations

SWMU B-15/16

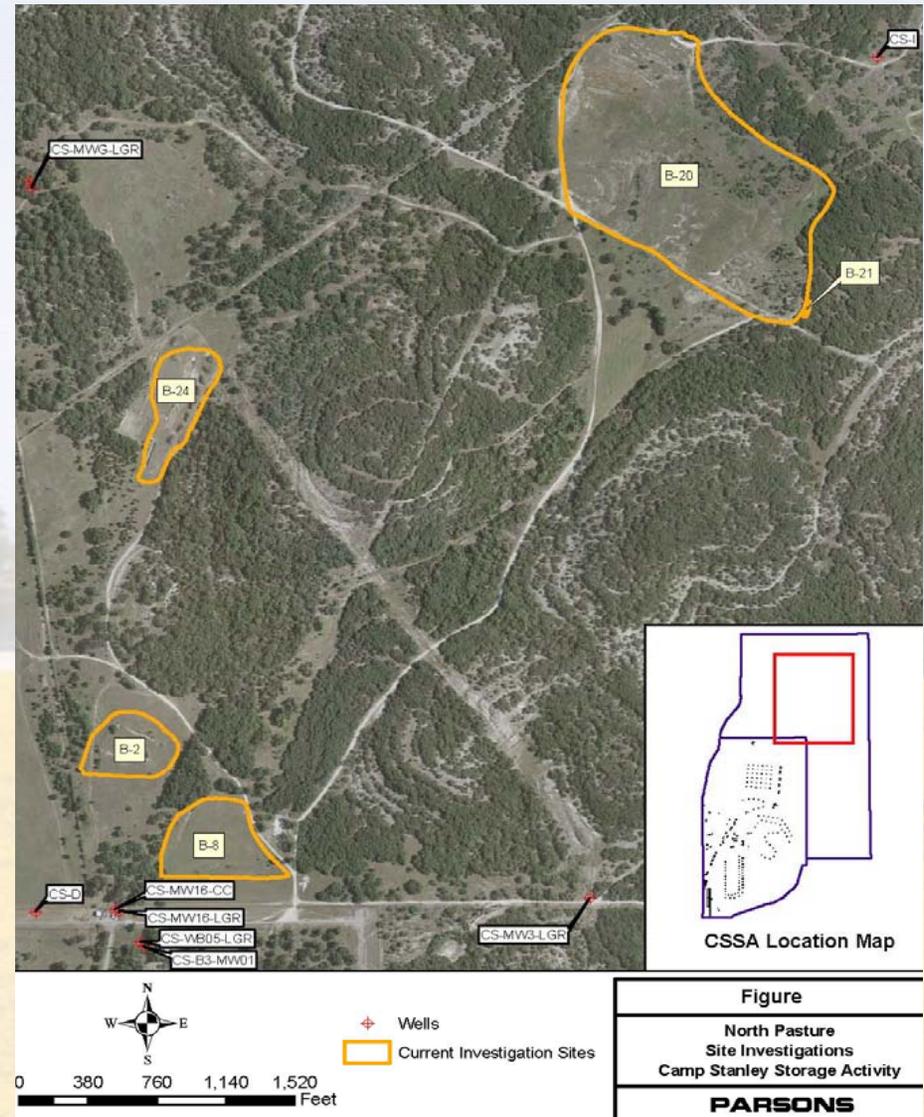
- Metal debris will be segregated from the soil matrix through ground surface sifting and sent off post for recycling.
- Anomaly removal action anticipated to commence in February 2010.
- The remaining excavated impacted media will be characterized and transported for off-post disposal as non-hazardous contaminated media or transported to RMU-1 for use as berm maintenance material.



Status of Site Investigations

SWMUs B-2 & B-8

- SWMU B-2 and B-8 were reportedly used as a burn sites during 1950's.
- Previous analytical results of investigation samples after removal actions indicate lead concentrations remain above background criteria but below Tier 2 criteria.
- Grid sampling to determine extent of remaining lead-contaminated soils throughout B-2 & B-8 area anticipated to commence in April 2010.



Status of Site Investigations

SWMUs B-2 and B-8 (cont.)

- Grid sampling to determine extent of remaining lead-contaminated soils throughout area using XRF analyzer with 10% of XRF samples collected for laboratory analysis.
- Combine sites for future work/closure due to proximity and similarity of contaminants
- Possible outcomes:
 - Additional removal and Tier 1 closure (with RIR)
 - Additional removal followed by No Further Action APAR using Tier 2 criteria
 - No Further Action APAR with Tier 2 criteria

SWMU B-2/B-8

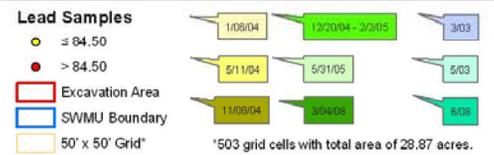
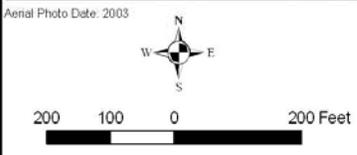
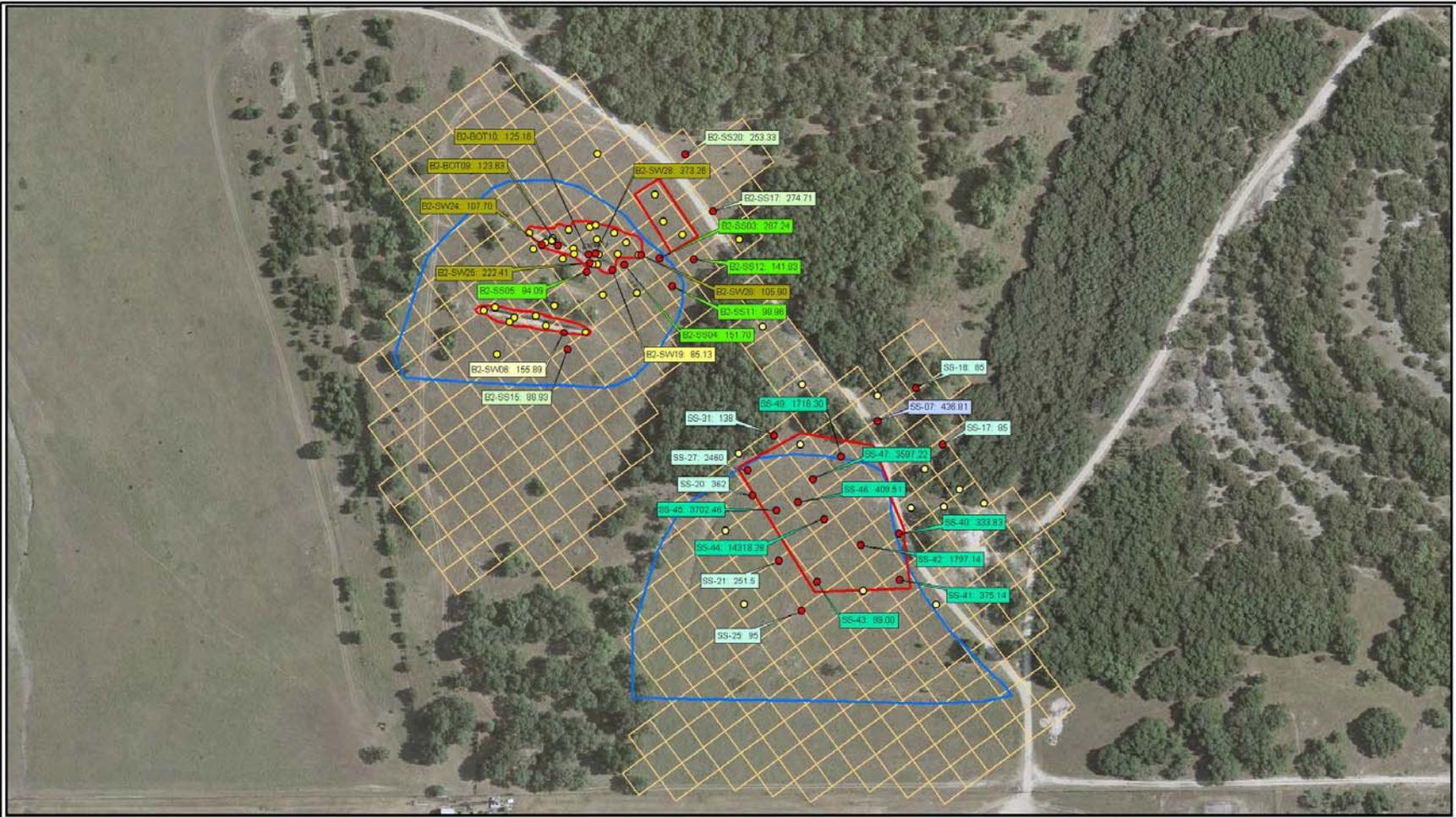


Figure 9.4
 B-2 & B-8 Sample Locations with
 Lead Results (2003 - 2008) and 50' Grid
 Camp Stanley Storage Activity

PARSONS

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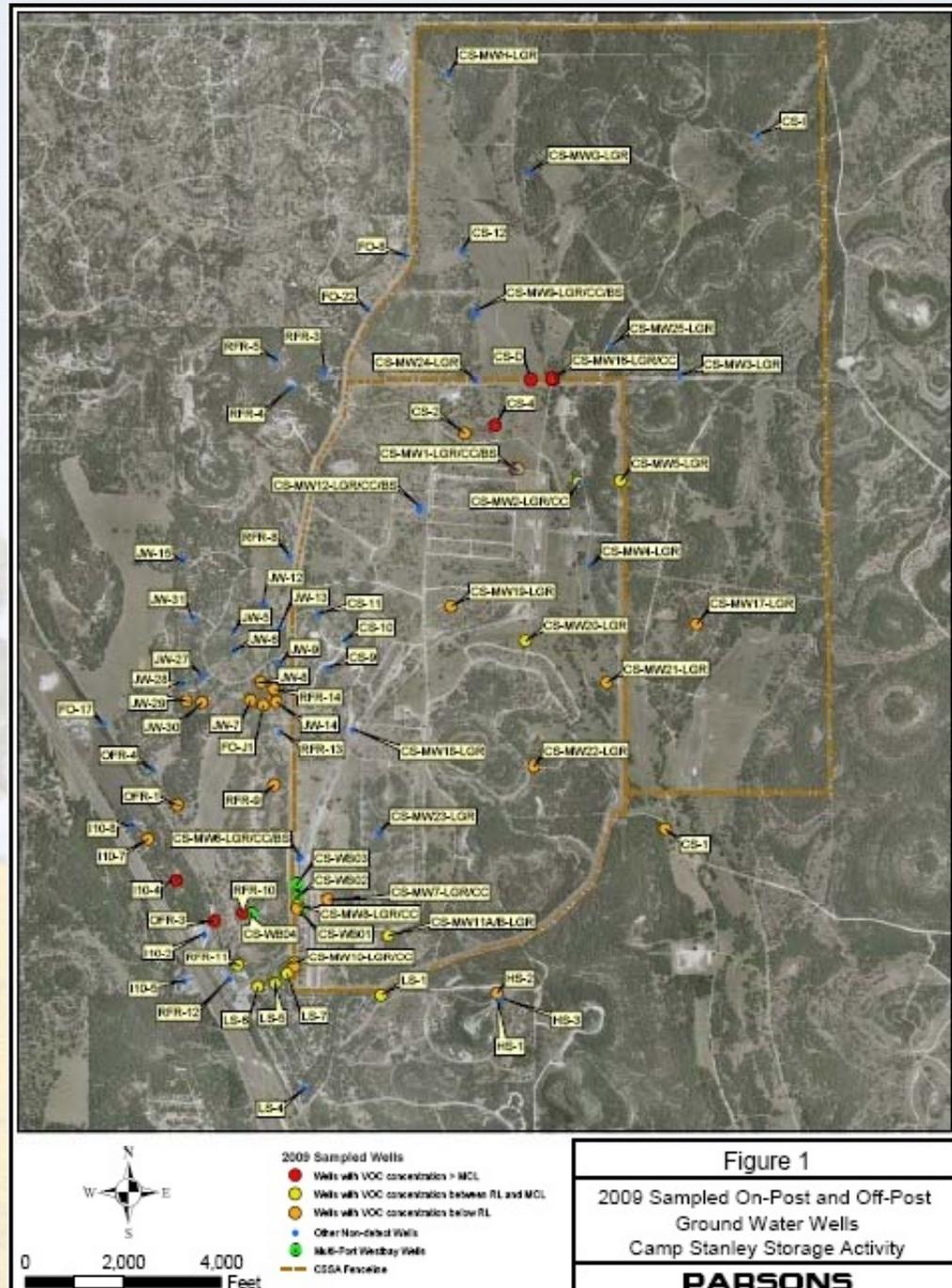
GROUNDWATER MONITORING UPDATE

Groundwater Monitoring Program Overview

- Quarterly Monitoring Program:
 - On-post since December 1999: 41 events
 - Off-post since September 2001: 34 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
 - 45 Off-post private and public supply wells
- 5 off-post wells have GAC units due to past exceedances

Groundwater Monitoring Program

Sampling Locations



Groundwater Monitoring Program

Recent Changes

- Prolonged drought (October 2007 – August 2009) has seemingly ended. Nearly 22 inches of rainfall between September-December 2009. Aquifer levels have rebounded 100 to 150 feet between September 2009 and February 2010.
- The 6 month carbon exchange was completed on the 5 off-post GAC units January 11, 2010.



Groundwater Monitoring Program

Recent Changes

- Off-post well I10-4 sampling results: PCE (5-8 $\mu\text{g/L}$) > MCL for the last 5 quarters (since December 2008). The pump has been removed from this well and it is NOT currently in use. A cap, lock, and contact information plate have been added for security.
- In December 2009, off-post well I10-7 had a trace detection of TCE in a field duplicate (0.17F $\mu\text{g/L}$). However, TCE was not detected in the parent sample. Since March 2002, this well has not had a detection.



Groundwater Monitoring Program

Recent Changes

- One new drinking water supply well (CS-12) installed in 2009. Coliform issues were reported March through May 2009. Well was repeatedly disinfected with mixed results.
- Between September 2009 and January 2010 over 14 million gallons has been pumped to the Bioreactor as a remedy.
- CS-12 has been free of coliforms since August 2009. Also passed 2 rounds of MPA during drought and recharge conditions.
- TCEQ has verbally indicated that well can be constructed as previously approved with stipulation that it will require monthly BACT sampling for the service life as a PWS well.



Groundwater Monitoring Program

2009 Results Overview

- A “*Snapshot*” sampling event, where all on-post wells were sampled, occurred in December 2009.
- VOC levels have increased with the recent rainfall and water levels have rebounded from drought conditions.
- One exception is former agricultural well, CS-4. This well has only been above the MCL once (June 2004 @ 5.1 µg/L PCE and 15 µg/L TCE), and generally ranges around 1.5 µg/L (both PCE and TCE).
- In December 2009, the results were 43.4 µg/L PCE and 86.9 µg/L TCE.
- Re-sampled in January 2010. A results below MCL for PCE/TCE/DCE.

Groundwater Monitoring Program

2009 Results Overview

- VOC levels have increased with the recent rainfall and water levels have rebounded from drought conditions.
- South-western delineation well (I10-7) had its first detection of PCE in December 2009. Off-post well (RFR-9) had its first detection (<RL) in September 2009.
- Metals exceeding the AL for lead in 2009 were former CSSA drinking water well CS-9 and monitoring well CS-MW9-BS. Mercury was also above the MCL in well CS-9 in June and Sept. 2009. In March 2009 monitoring well CS-MW1-LGR exceeded the MCL for chromium.
- All metals exceedences in the 6 new monitoring wells installed in 2007 have cleaned up.

Groundwater Monitoring Program

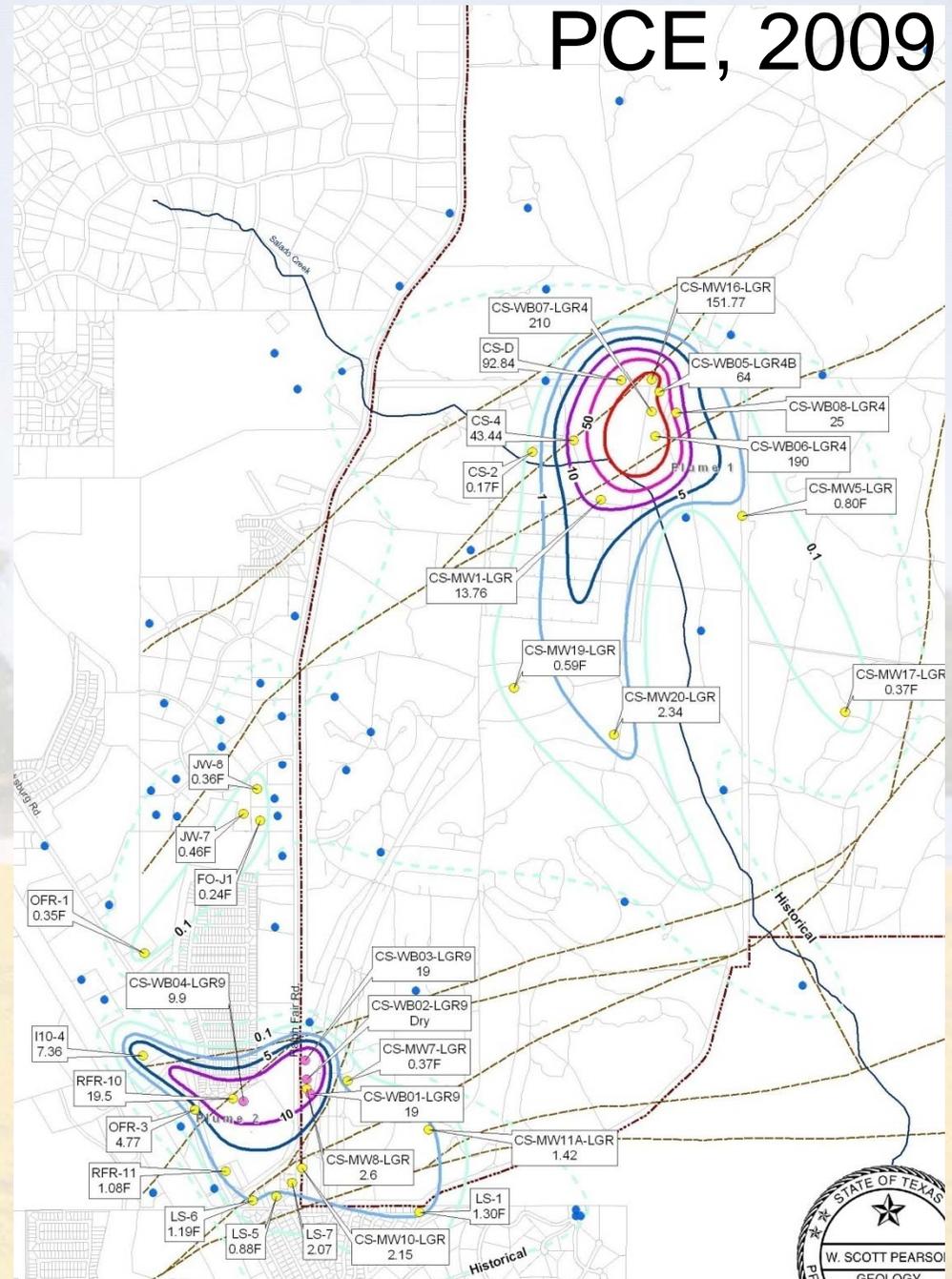
CSSA Weather Stations

Quarter	Quarterly precip. (inches) North WS	Quarterly prec. (inches) South WS	Year precipitation (inches)	Average GW elevation Change (feet)
Mar-02	2.25	--	50.6	-70.97
Jun-02	4.46	--		-48.29
Sep-02	30.98	--		104.5
Dec-02	12.91	--		19.48
Mar-03	6.22	6.68	21.73	-8.47
Jun-03	4.67	4.64		-41.08
Sep-03	8.05	10.28		-52.85
Dec-03	2.79	2.92		-32.85
Mar-04	6.35	5.93	54.64	22.89
Jun-04	12.95	12.33		71.91
Sep-04	14.3	14.57		-8.05
Dec-04	21.04	23.12		63.07
Mar-05	7.38	6.48	20.11	-6.47
Jun-05	NA	5.29		-45.93
Sep-05	NA	5.93		-61.24
Dec-05	NA	2.41		-57.9

Quarter	Quarterly precip. (inches) North WS	Quarterly precip. (inches) South WS	Year precipitation (inches)	Average GW elevation Change (feet)
Mar-06	2.52	1.11	18.27	-24.81
Jun-06	7.65	11.18		-9.46
Sep-06	3.42	3.12		-6.66
Dec-06	4.68	5.9		2.48
Mar-07	9.83		53.17	14.53
Jun-07	11.99			182.09
Sep-07	29.4			15.56
Dec-07	1.95			-70.45
Mar-08	2.17	2.31	11.82	-42.45
Jun-08	1.9	2.69		-51.71
Sep-08	6.06	6.95		-27.49
Dec-08	1.69	1.74		-15.48
Mar-09	2.58	3.16	29.61	-4.25
Jun-09	3.77	4.41		1.25
Sep-09	NA	7.41		-7.76
Dec-09	NA	14.63		101.24

Groundwater Monitoring Program Summary

- 9 yrs of quarterly off-post monitoring.
- ~11 yrs of quarterly on-post monitoring.



Groundwater Monitoring Program

DQO Update

- Revised metals list for on-post wells:
 - Monitoring wells: chromium, cadmium, mercury, lead
 - Drinking water wells: arsenic, barium, chromium, copper, cadmium, mercury, lead, zinc.
- Addition of annual snapshot event.
- Implementation of updated 2010 LTMO recommendations, on- and off-post.
- Addition of 1 drinking water well.

Groundwater Monitoring Program

Upcoming Work

- LTMO currently being updated with results from 2005 – 2009.
- Continued quarterly monitoring and GAC maintenance
- Off-Post Well Survey Update to capture any new wells near CSSA and extend the $\frac{1}{4}$ mile survey radius to $\frac{1}{2}$ mile.

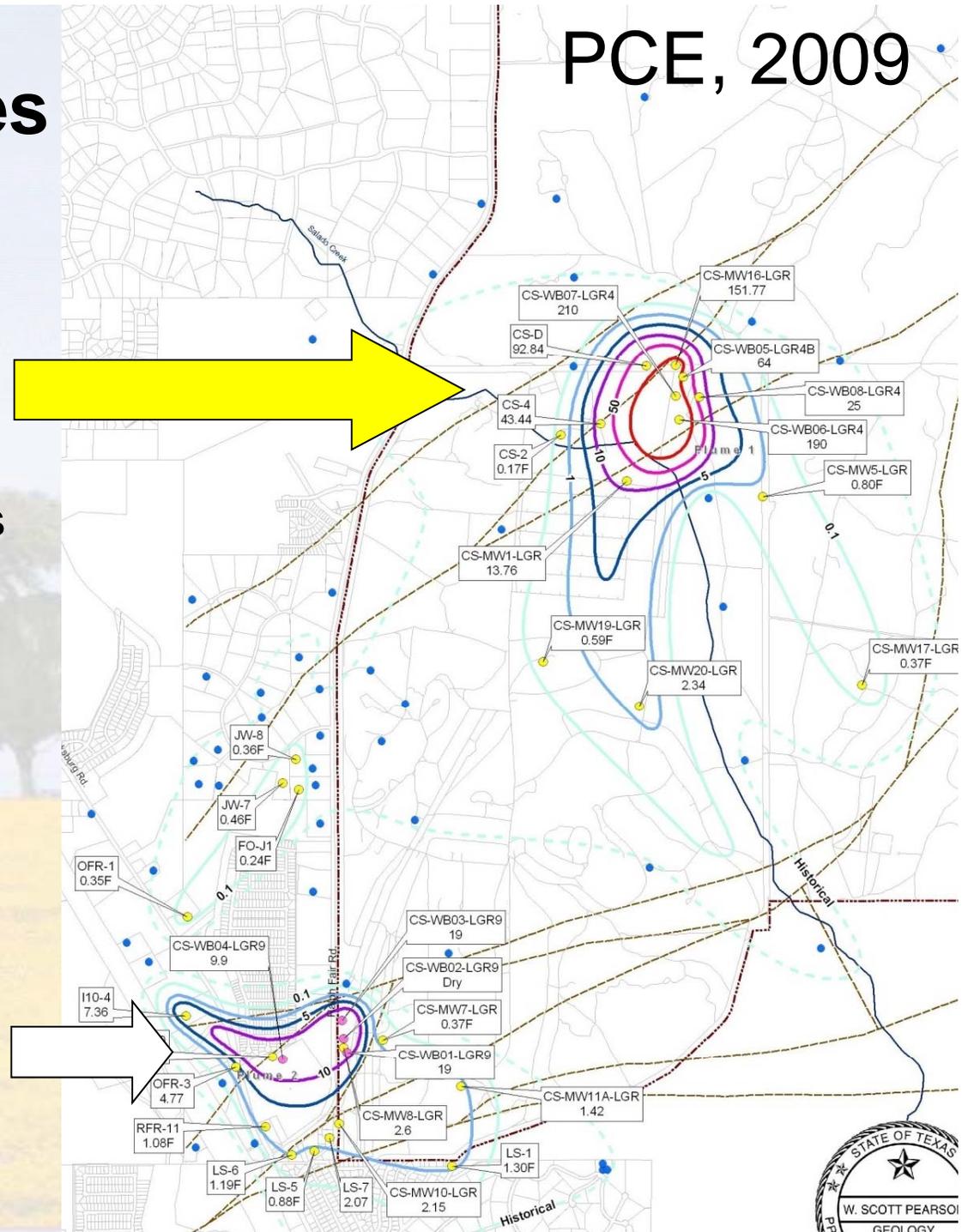


TREATABILITY STUDIES (B-3 AND AOC 65)

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 Bioreactor

- 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.

Taking Advantage of Leaky Disposal Trenches in Fractured Bedrock

Removal Action

Ken R. Rice (Parsons, Austin, TX), Glare Sanchez (Camp Stanley Storage Activity, Boerne, TX), Chris Beal (Portage Environmental, Boerne, TX), Robert Edwards (Noblis, San Antonio, TX)

Right: Previous mission support at Camp Stanley Storage Activity (CSSA) has resulted in a contaminated groundwater plume from releases of chlorinated solvents in a former landfill referred to as Solid Waste Management Unit B-3 (SWMU B-3).



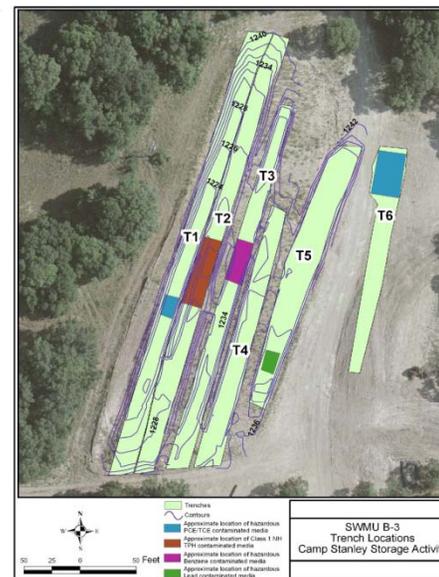
Left: Removal actions initiated April 2006 removed waste and contaminated media from six trenches at SWMU B-3.



Right: Waste matrix included metal debris and potential unexploded ordnance.



Left: Removal actions resulted in the removal of approximately 15,000 cubic yards of waste and contaminated media from SWMU B-3.



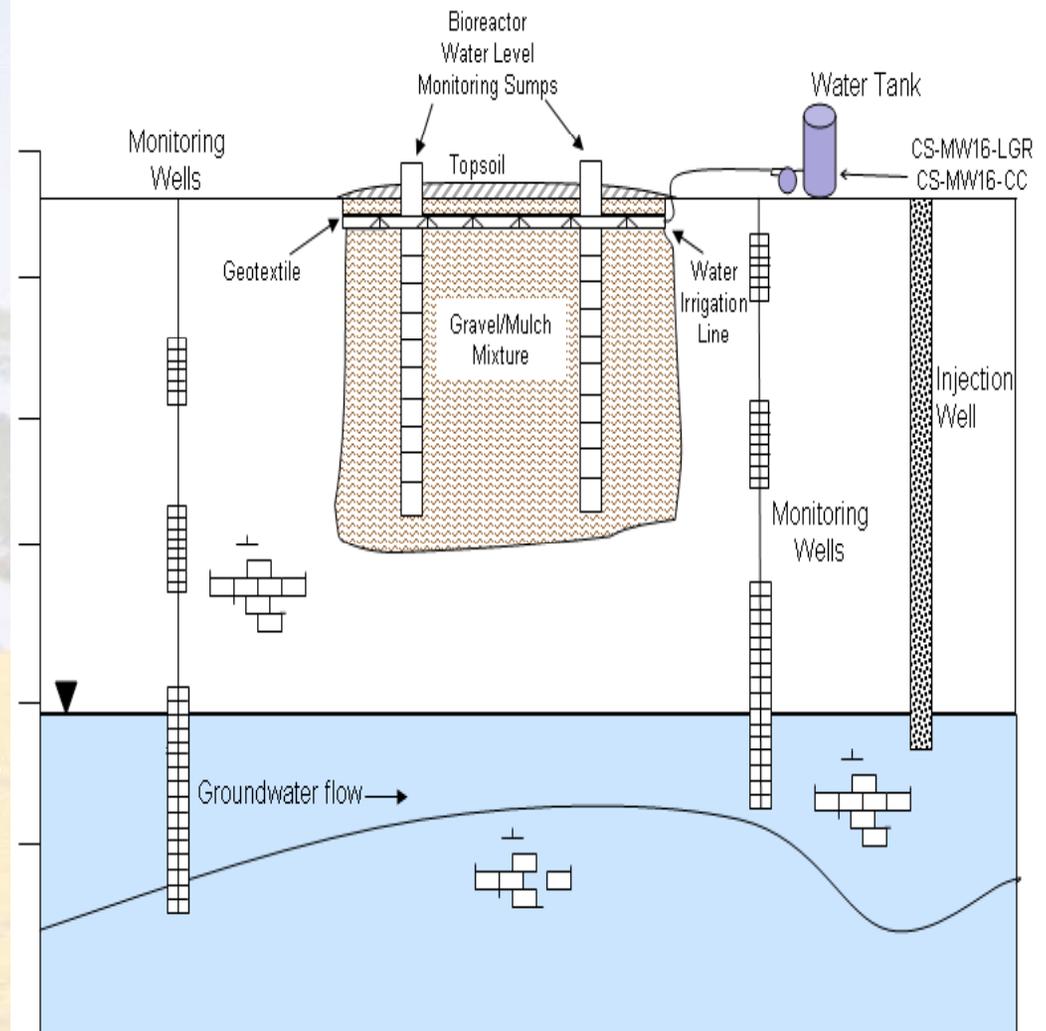
Summary of Removal Actions

- Removal Action completed for all contaminated waste and media within SWMU B-3 and managed through off-post permitted facilities.
- Underlying fractured rock remaining under six trenches at SWMU B-3.

B-3 Bioreactor Pilot Study Objectives

Review

- Determine if the bioreactor is an effective approach for treatment of groundwater at SWMU B-3 (Plume 1).
- Evaluate the extent of bioreactor influence on the effectiveness of treatment in the surrounding fractured media.
- Evaluate the migration of contaminants through the underlying formations and into the underlying aquifer.



Bioreactor conceptual design

B-3 Bioreactor Pilot Study

General Observations

- Bioreactor is effectively treating injected contaminated groundwater. Saturated conditions are being maintained through injection of recovered groundwater, precipitation, and CS-12 augmentation.
- Significant contaminant concentrations likely remain in the fractured bedrock formation. Data indicates underlying CVOCs are being flushed. Biotic and abiotic degradation is occurring.
- Isotope data suggest water surrounding bioreactor comes from several different sources and a connection of the LGR and the CC aquifers near WB-08.

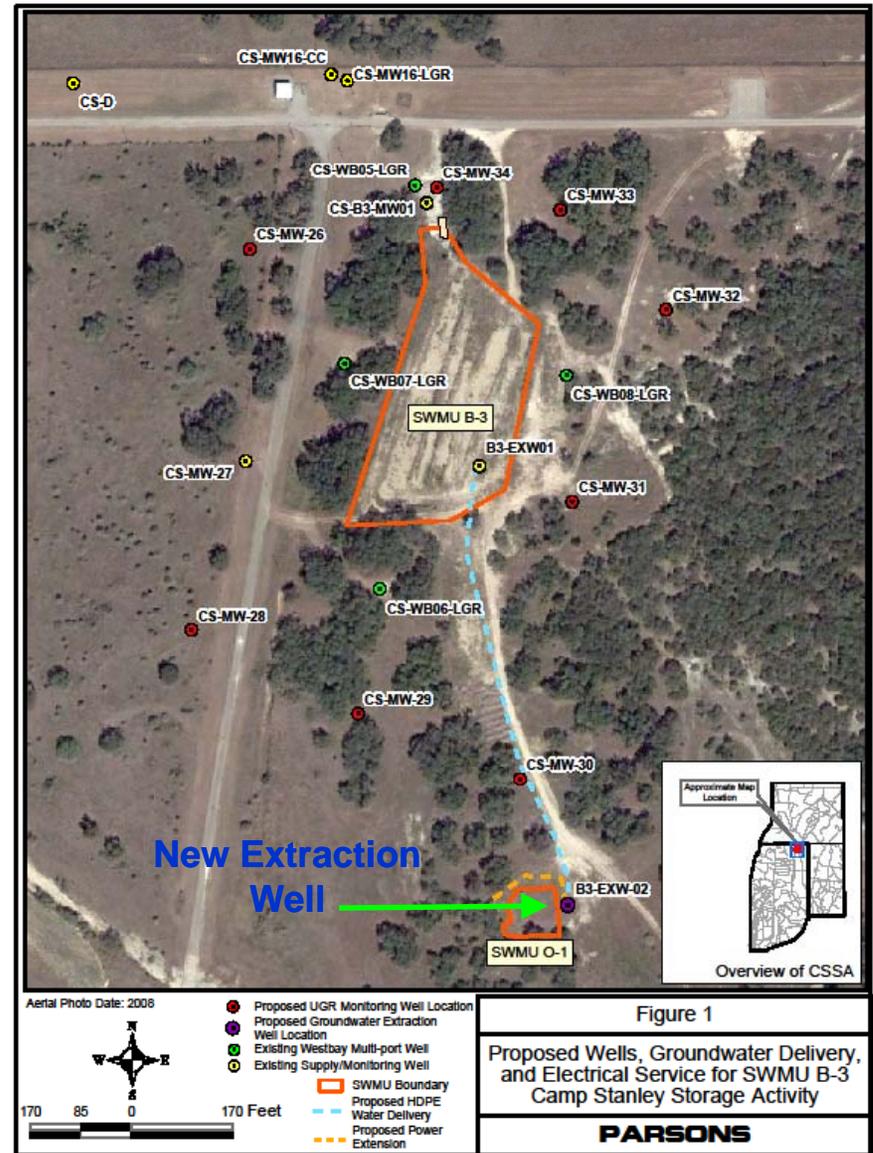
B-3 Bioreactor Pilot Study Data

Recommendation 1: More Water

Objective - Determine if bioreactor is effective approach for treatment of Plume 1 groundwater. Currently, trenches 1 and 2 are operational. Contaminated aquifer water is optimum source of water to increase volume of injection into trench, therefore, the additional extraction well will help maintain saturated conditions with contaminated aquifer water and allow greater bioreactor influence on vadose zone intervals.

Recommendation - Add additional extraction wells for bioreactor injection.

In Progress – The B3-EX01 extraction well was added in July 2009. Installation of a second extraction well to supply aquifer water to bioreactor is scheduled to start-up in May 2010.



B-3 Bioreactor Pilot Study

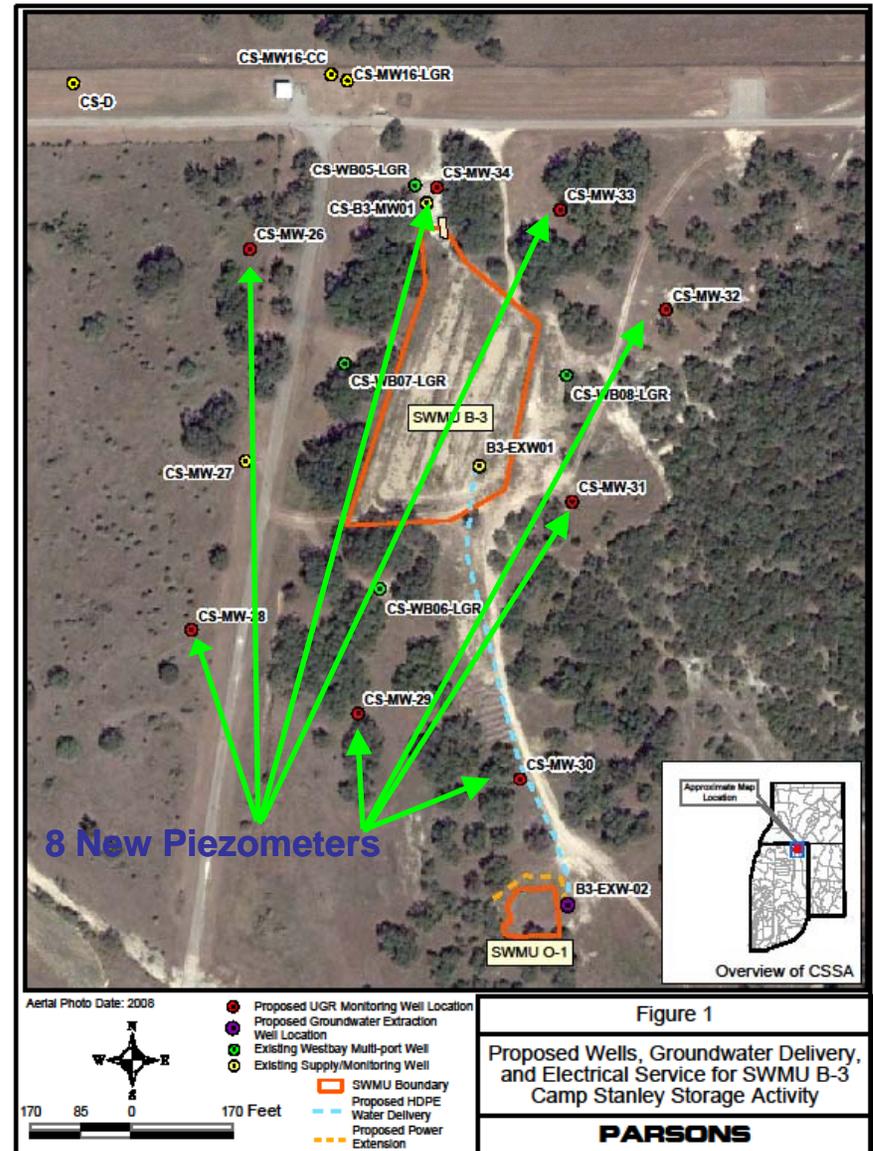
Recommendation 2: More MWs

Objective - Evaluate extent of bioreactor influence on effectiveness of treatment in vadose intervals.

Data Gap - Additional monitoring data needed to determine if Plume 1 is reducing in toxicity, mobility and volume. Current data indicates the extent of migrating intermediate contaminants such as vinyl chloride and manganese from the bioreactor are unknown. Need additional data in the upper formations underlying the bioreactor to determine extent of bioreactor influence.

In Progress - Add eight additional shallow wells (completed within the UGR at a depth of approximately 35 ft bgs) near former SWMU B-3 to monitor possible contaminants emanating from the bioreactor. One shallow well completed (CS-MW-27).

Future Actions –Groundwater monitoring from additional shallow wells is included in the updated O&M plan.



B-3 Bioreactor Pilot Study

Recommendation 3: Tracer Study

Objective - Evaluate the migration of contaminants through the underlying formations and into the underlying aquifer.

Data Gap – (A) Need additional monitoring data for determining migration of contaminants through the bioreactor's underlying formation and aquifer.

(B) Need tracer study to determine the potential migration pathways of contaminants from bioreactor.

In Progress – (A) Continue monitoring of bioreactor for another one year and re-evaluate. Monitoring funded through October 2010

Completed – (B) Perform water tracer study within bioreactor trench 6.

Tracer Study Results

- Flood test results indicate:
 - **Trenches**
 - A direct connection from trench 6 to trench 1
 - **Unsaturated zones**
 - A connection from T-6 to the UGR hydrostratigraphic zone in WB06, WB07, and WB08.
 - A connection from T-6 to the LGR-02 hydrostratigraphic zone in WB06 and WB07.
 - **Saturated zones**
 - A connection from T-6 to the LGR-03B hydrostratigraphic zone in WB06 and WB07.
 - **Timing** of water level change is key to determine source.
 - Precipitation – bottom filling; lower units exhibit change sooner than upper units.
 - Flood test – top filling; upper units exhibit change sooner than lower units.

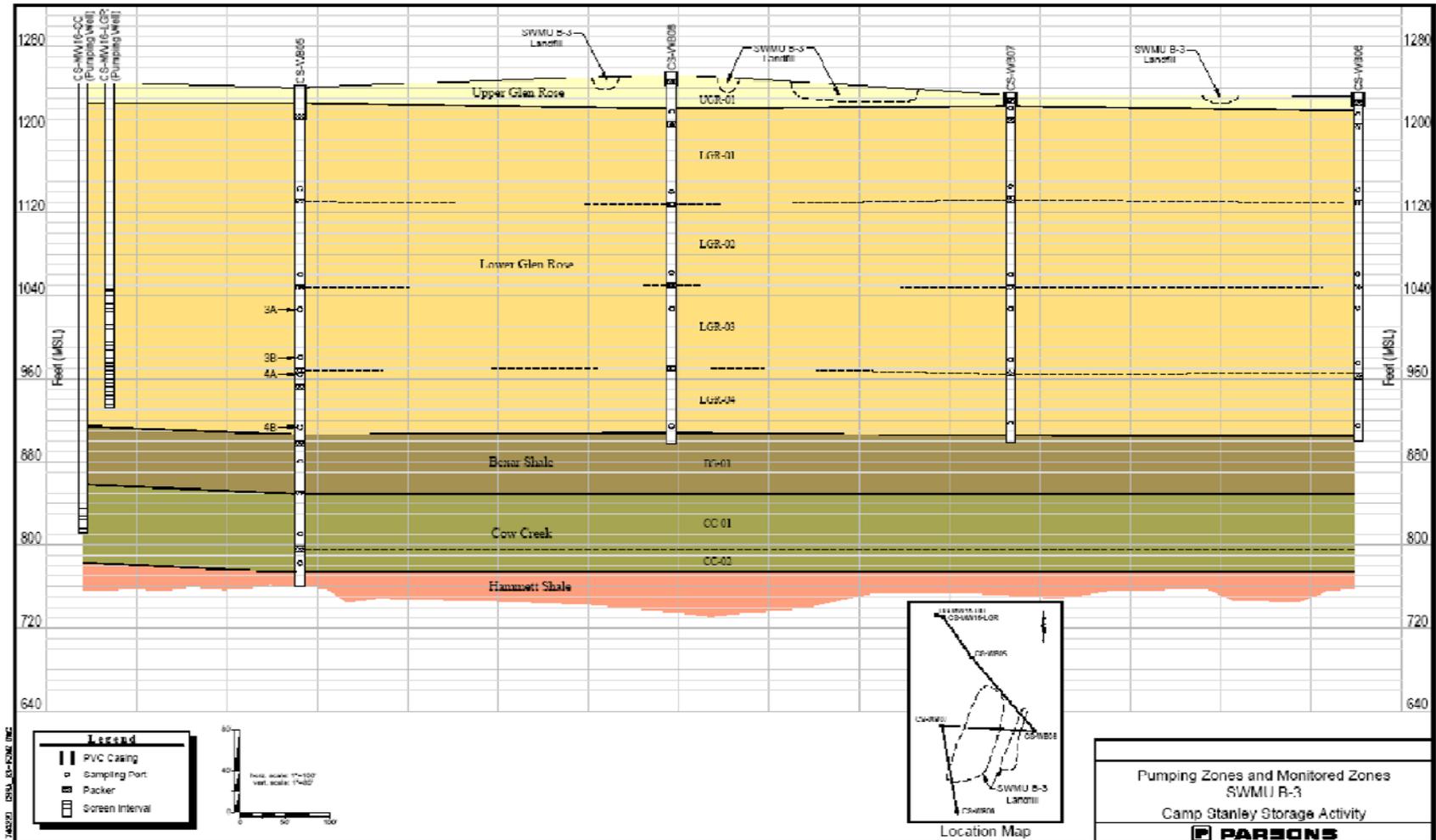
B-3 Bioreactor Pilot Study Objectives

Review and Summary

- Determine if the bioreactor is an effective approach for treatment of groundwater at SWMU B-3 (Plume 1).
 - Biodegradation occurring, but need to capture additional water.
 - **In progress: installing second extraction well at O-1 (March, 2010).**
- Evaluate the extent of bioreactor influence on the effectiveness of treatment in the surrounding fractured media.
 - Local extent currently unknown
 - **In progress: installing 9 shallow monitoring wells (March, 2010).**
- Evaluate the migration of contaminants through the underlying formations and into the underlying aquifer.
 - Local migration pathways not fully understood
 - **Continued monitoring at least through October 2010**
 - **Tracer study using CS-12 groundwater identified connections from T-6 to other trenches, and unsaturated and saturated zones in nearby Westbay wells.**

CSSA Pilot Studies

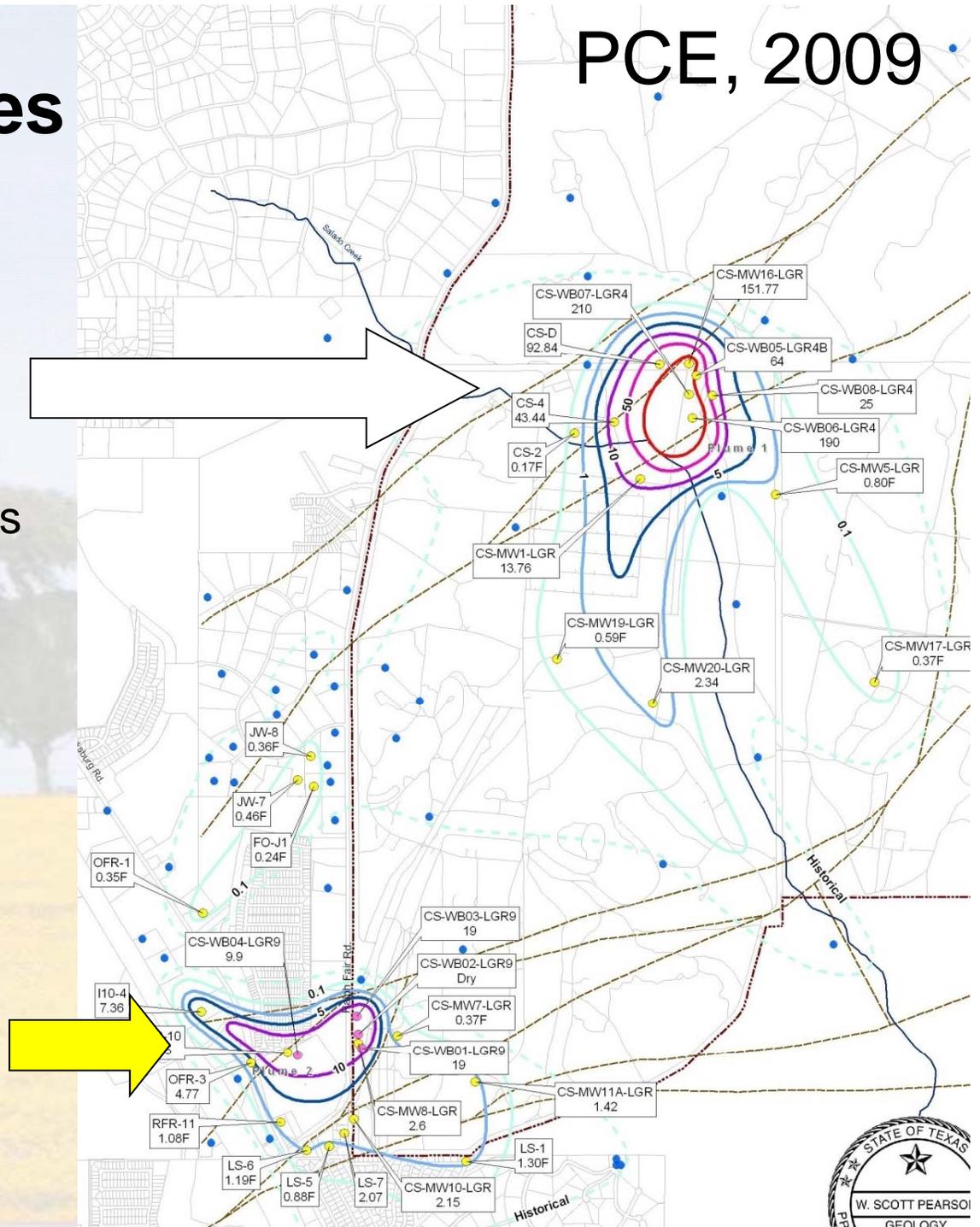
SWMU B-3 Bioreactor Cross-Section



CSSA Pilot Studies Description

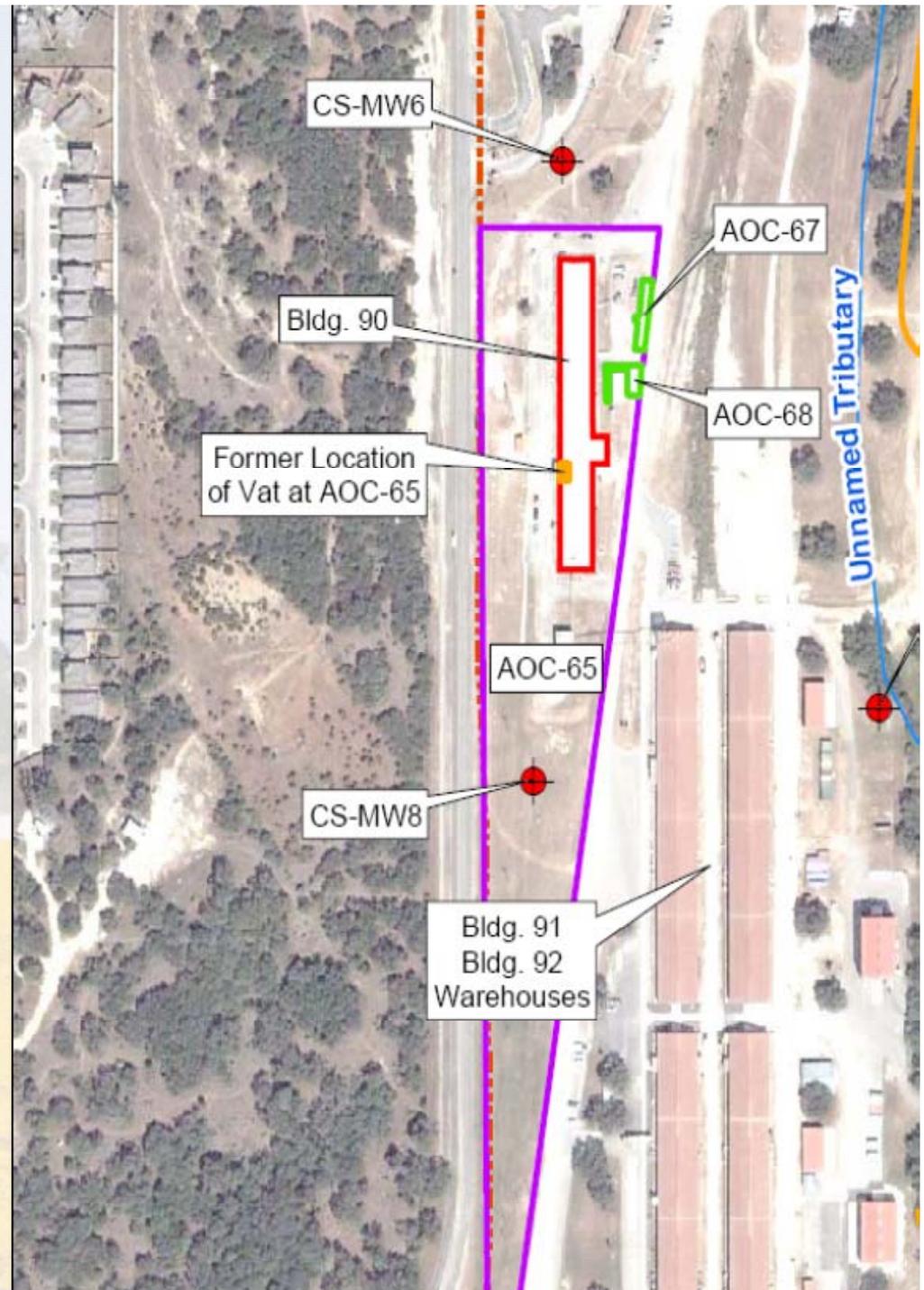
1. SWMU B-3 Bioreactor Pilot Study:
Enhanced anaerobic bioremediation of chlorinated hydrocarbons in underlying fractured limestone at Plume 1.

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



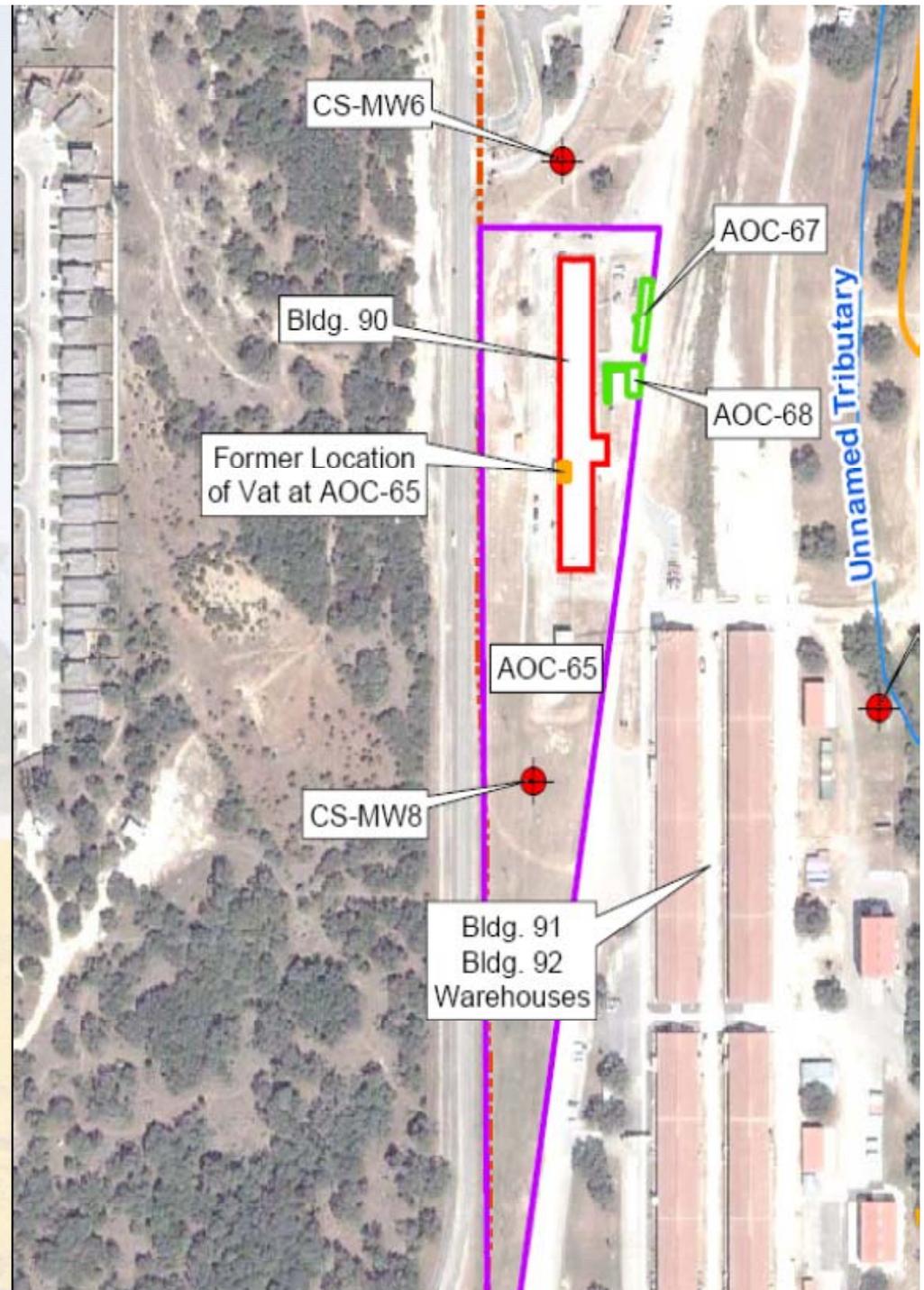
AOC-65 Background

- AOC-65 consists of an area surrounding Building 90.
- Operations included chlorinated solvent degreasing units (vats) which ceased operations in 1995.
- Initial investigations identified groundwater plume (2) in 1999.
- Interim Removal Actions in 2001 disposed ~ 1,300 CY of impacted media off-post.
- SVE Pilot Study initiated in 2002.



AOC-65 Background

- AOC-65 consists of an area surrounding Building 90.
- Operations included chlorinated solvent degreasing units (vats) which ceased operations in 1995.
- Initial investigations identified groundwater plume (2) in 1999.
- Interim Removal Actions in 2001 disposed ~ 1,300 CY of impacted media off-post.
- SVE Pilot Study initiated in 2002.



Current AOC-65 SVE Pilot Study

Study

Observations

- SVE appears to be removing some amounts of CVOCs from the underlying limestone. Estimated removal rate of PCE (based on analytical data from average of sampling events) for SVE system is:
 - AOC-65 SVE system = 108 lb/yr¹
- Emissions continue to be within permit by rule (PBR) limits:
 - AOC-65 SVE permitted PCE emission allowance = 0.268 lb/hr
 - Actual AOC-65 SVE PCE emission rate = 0.021 lb/hr¹



Note 1 – Estimated removal rate from 2008-2009 sampling of SVE extraction well emissions.

AOC-65 Treatability Study Enhancement

Next Steps

- Determine effectiveness of thermally-enhanced SVE (using steam).
- Perform a Technology Assessment to identify other potential remedial options.

AOC-65 Treatability Study Enhancement

Objectives of Thermal-Enhanced SVE Pilot Study

- Apply steam heat to Bldg. 90 subslab system as thermal source to determine if adsorbed CVOCs in underlying limestone volatilize.
- Determine if thermally enhanced SVE is an effective approach for additional removal of CVOOC from the underlying limestone formation.
- In progress: Preparing work plans to perform limited study using existing SVE system and CSSA Bldg 89 boiler.

AOC-65 Treatability Study Enhancement

Technology Assessment Objectives

- Describe currently identified remedial options (e.g., thermally-enhanced SVE).
- Identify and describe other possible technologies to evaluate.
- Provide preliminary evaluation of pros and cons of each technology.
- Address possible increased contaminant migration caused by remediation process.
- Identify path forward for additional pilot studies and remediation.
- **Draft Technology Assessment to be completed in 2010.**

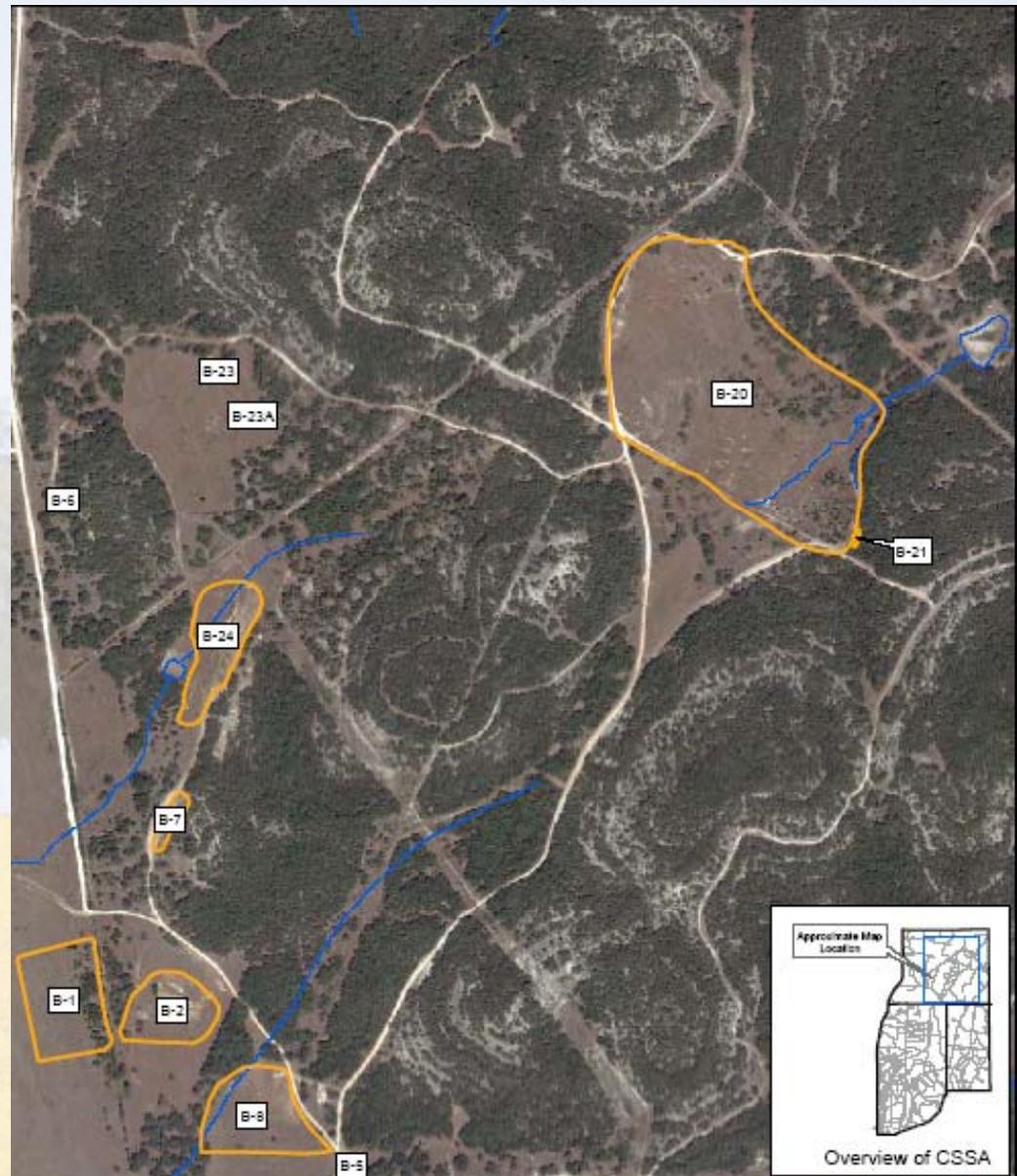


North Pasture Sites Update (SWMU B-20/21 & B-24)

North Pasture Technology Assessment

SWMUs B-20/21 and B-24

- Describe site histories and investigations to date
- Outline remedial action alternatives
- Overview available remediation technologies
- Discuss next steps



Technology Assessment

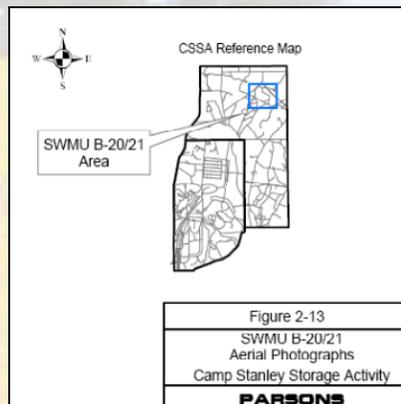
General Considerations

- Goal for both SWMUs is site closure.
- Both SWMUs have:
 - munitions and explosives of concern (MEC); and
 - munitions constituents (MC) present in soil.
- MEC issue must be addressed prior to MC contamination.
- Regulators threshold for site closure regarding MEC must be negotiated.
- Some sort of future land use restrictions will likely be required.

SWMU B-20/21

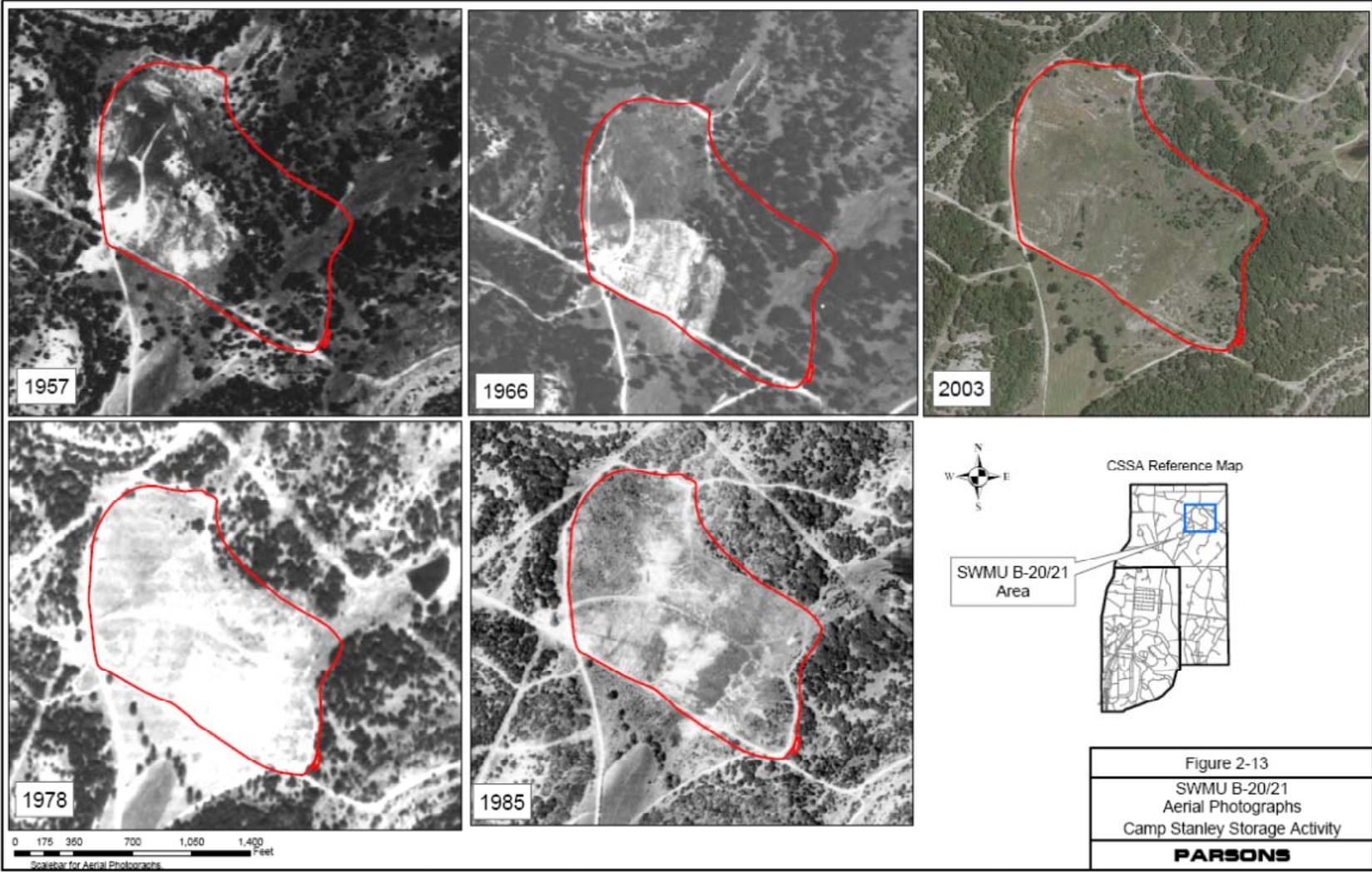
Site History

- ~ 33.5 acres
- Used periodically from 1946 to 1987
- Demolition and disposal activities, including OB/OD of conventional ordnance.



SWMU B-20/21

Historic Aerials



SWMU B-20/21

Investigations to Date

- 1994: Sampling of surface soil, subsurface soil and rock, groundwater, sediment, and surface water; and some removal of surficial MEC
- 1995 and 1996: Surface and subsurface soil sampling, and some surface and subsurface MEC clearance (analog method)
- 1997: Continued surface and subsurface MEC clearance using sifting operations
- 2008: Surface and subsurface soil sampling
- 2009: Geophysical mapping, Eco risk assessment work plan
- 2010: MEC Hazard Assessment and Technology Assessment



SWMU B-20/21

MEC Findings

Over 1,300 surficial and subsurface MEC items found including:

- Small arms ammunition
- Projectiles: 20, 30, 40, 57, 60, 66, 75, 90, & 120mm (~55%)
- Mortars including 60mm, 81mm, 107mm, 3" Stokes, 4" Stokes (~3%)
- 20-lb fragmentation bombs (~5%)
- Hand grenades (~3%)
- Anti-personnel and anti-tank mines (~1%)
- 2.75", 3.5", 66mm, and 5" rockets (~2%)
- Miscellaneous demolition materials including blasting caps, fuzes, etc. (~30%)
- ❖ Three BLU antipersonnel bomblets (cluster bomb submunitions)

In summary:

- **Wide variety of items**
- **Very small items (20 mm projectiles)**
- **High risk items (BLU antipersonnel bomblets)**

1994 Removal Effort



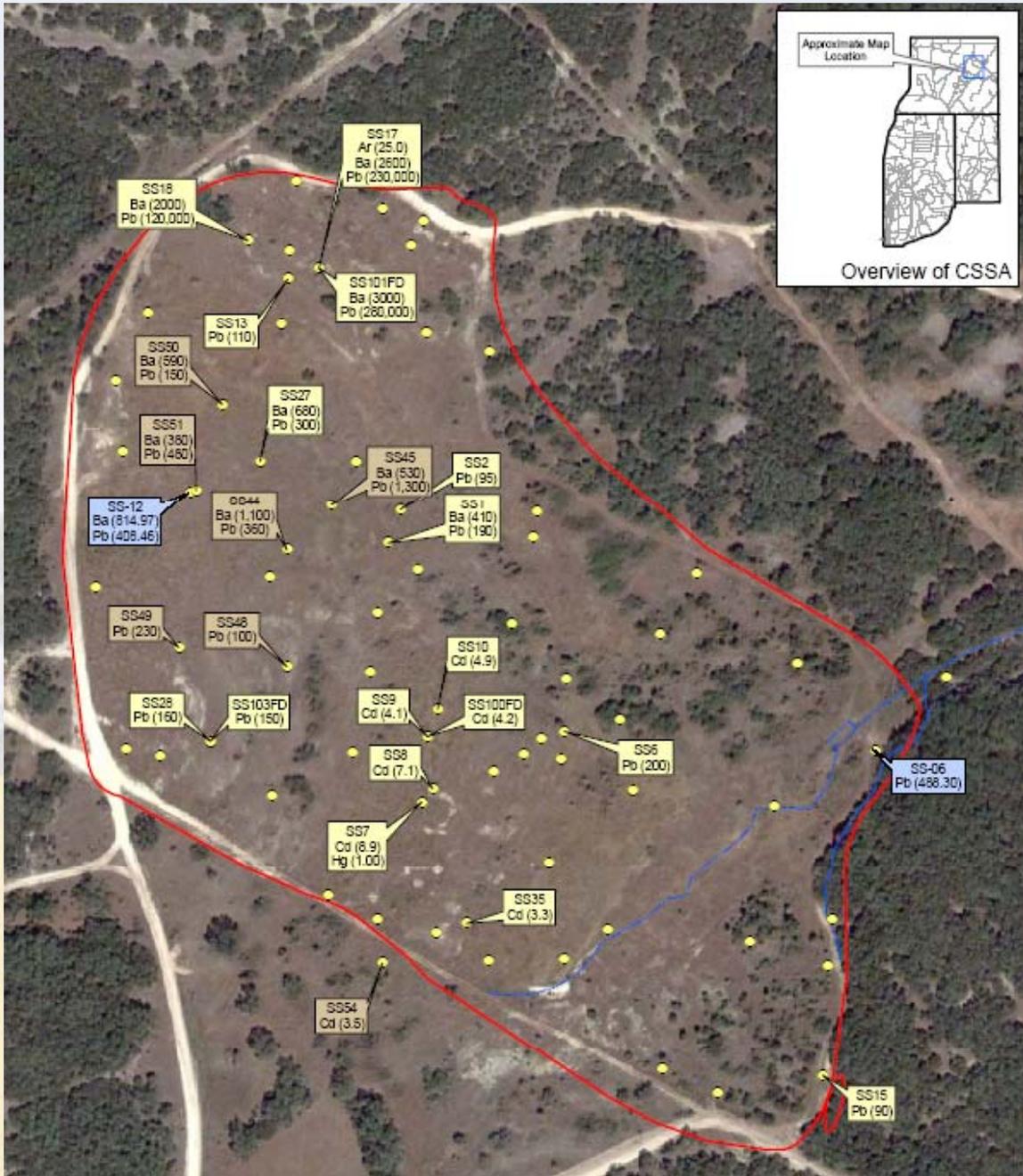
BLU Series Antipersonnel Bomblet



UXO items found. 80mm mortar on the left. Booster cup on the right.



UXO item found. White material in center is explosive residue.



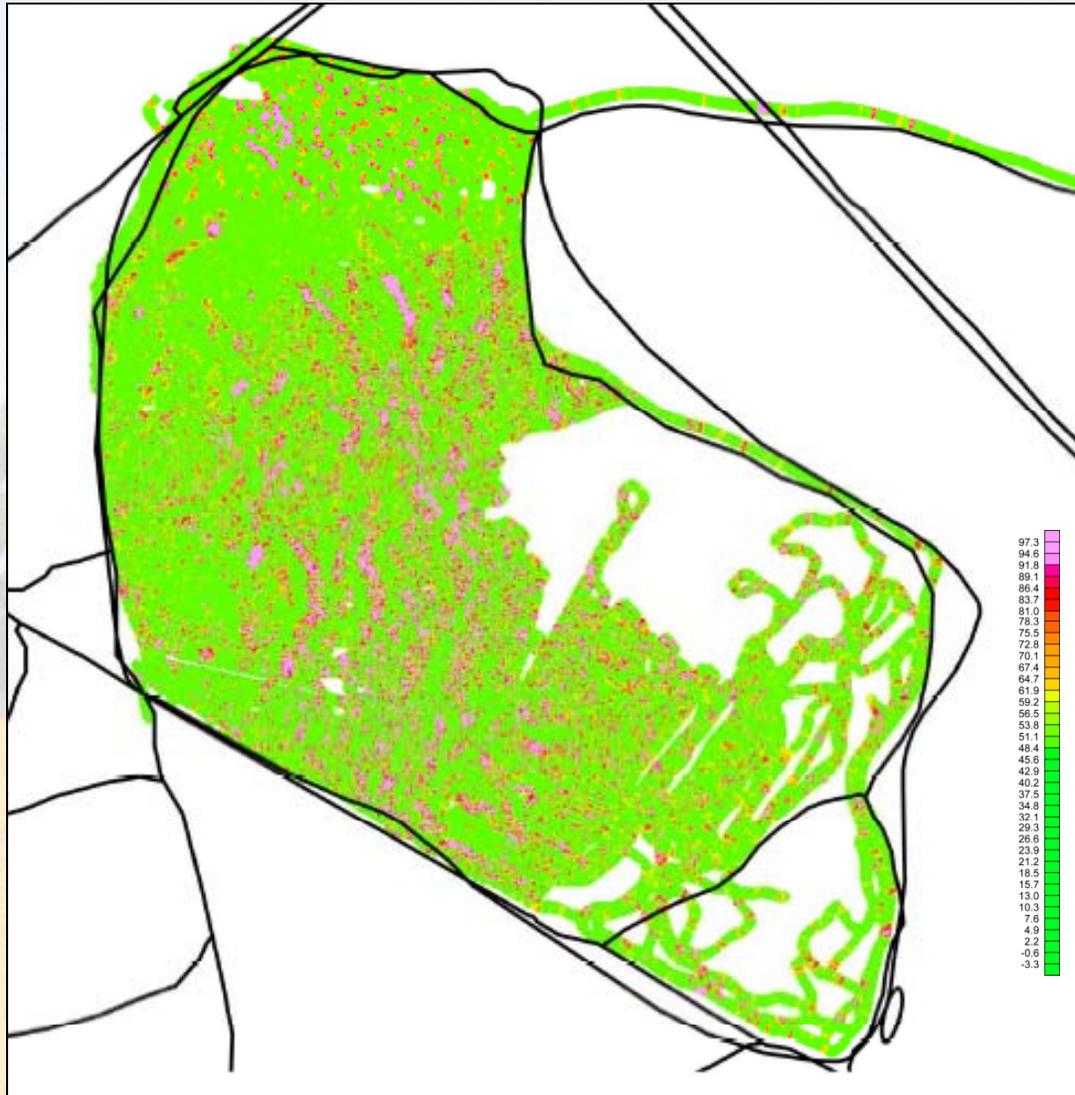
SWMU B-20/21 MC Findings

- Minimal MC contamination found above Tier 1 TRRP standards
- Little to no contamination expected above Tier 2 Human Health TRRP standards
- Eco criteria lower and may require some soil removal

	Samples collected June 23, 2008*
	Samples collected 1995*
	Samples collected June 1998*

*Concentrations shown (mg/kg) indicate above TCEQ TRRP criteria (April 23, 2006)

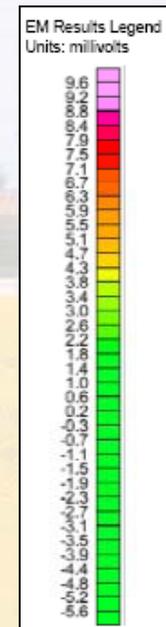
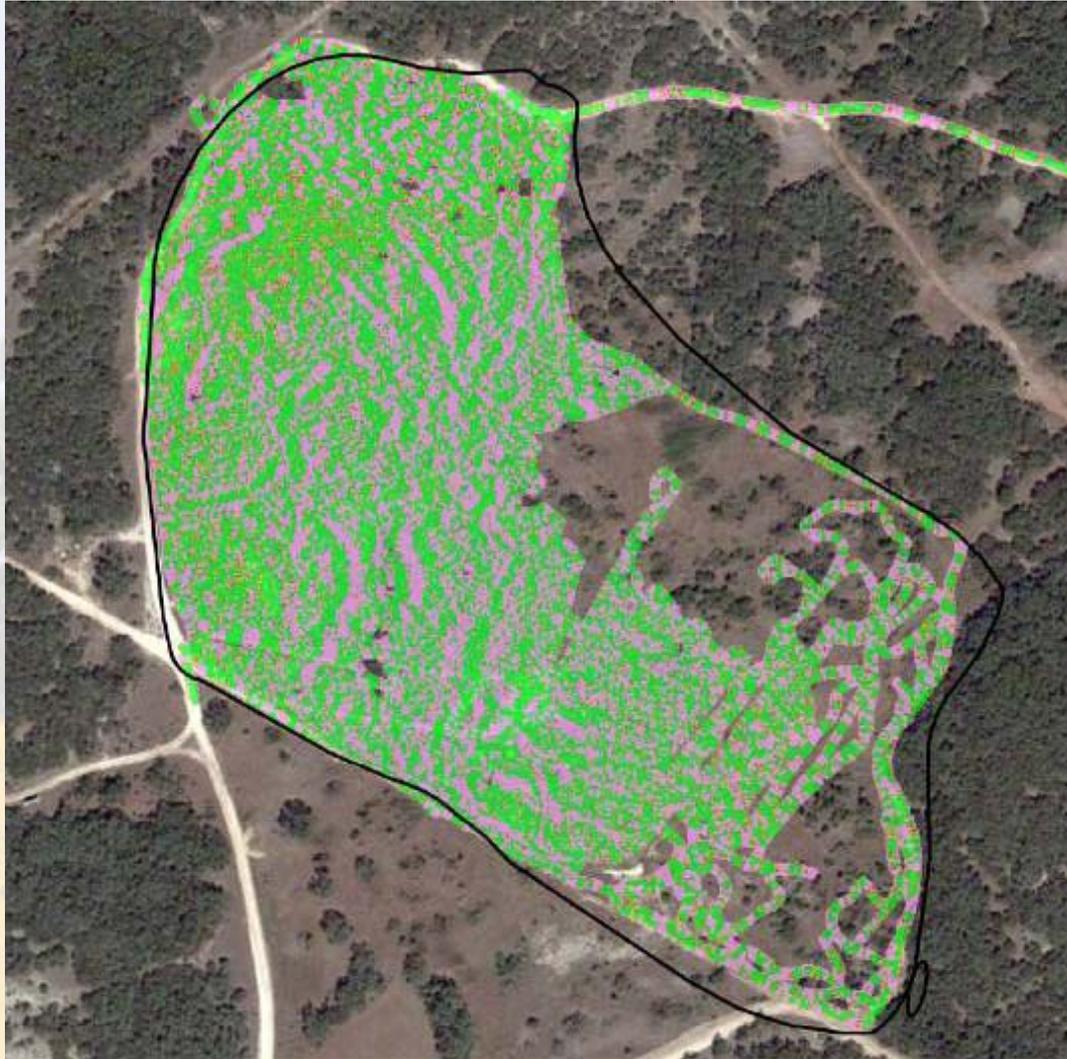
SWMU B-20/21 2009 Geophysical Survey



- 100-millivolt threshold (*not suitable for size of munitions found at this site*)

SWMU B-20/21 2009 Geophysical Survey

- 10-millivolt threshold
*(threshold for sites with
20mm projectiles)*



SWMU B-20/21

MEC Hazard Assessment

- Provides site-specific analysis of affects of different removal or remedial actions, including land use activities and access control.
- Also based on the type of ordnance, type of site (OB/OD), depth expected, sensitivity of munitions, and accessibility.

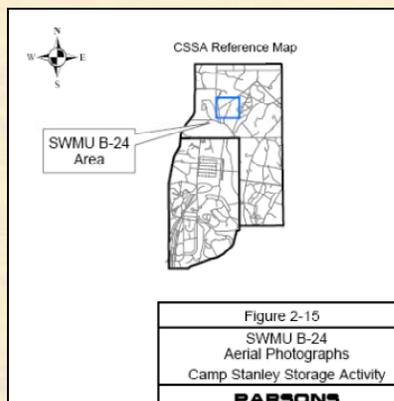
Hazard Level	MEC HA Score Range	CSSA Sites
1 (highest)	840 - 1000	B-20/21 score = 840
2	725 – 835	B-24 score = 770
3	530 – 720	
4 (lowest)	125 – 525	

SWMU B-20/21

Bottom Line

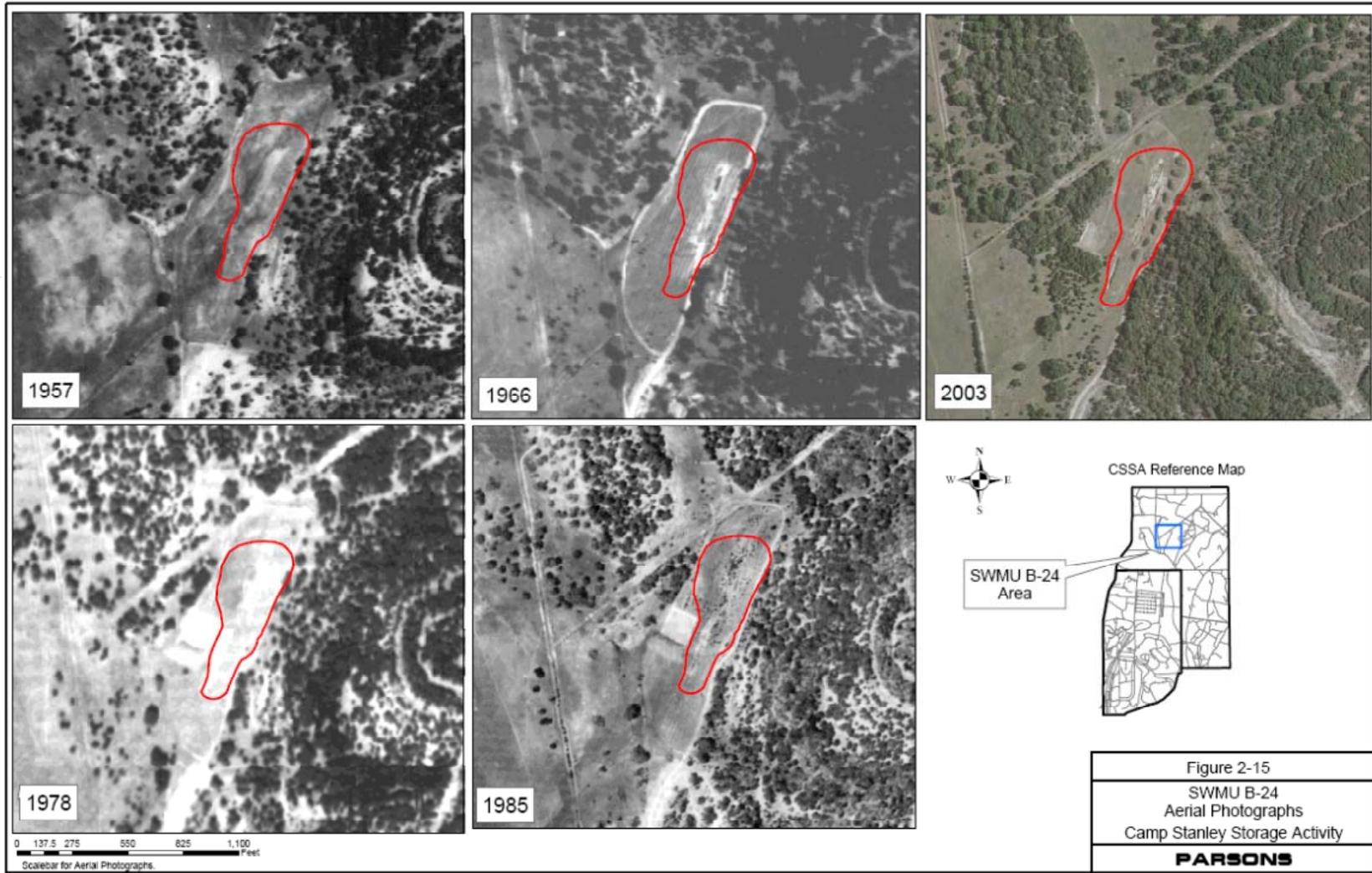
- Extensive sampling shows MC above background, but generally below Tier 2 Human Health TRRP criteria
- Numerous MEC items found, wide variety of types and sizes
- 2009 Geophysical survey shows numerous anomalies located throughout the site
- MEC delineation unconfirmed - munitions debris located outside the site boundary, could potentially include MEC
- Baseline MEC HA score of 840, which corresponds to Hazard Level of 1 (Highest Hazard)

SWMU B-24 Site History



- ~ 5 acres
- Exact dates of usage unknown, presumed before 1966 to late 1980's
- Former waste sites composed of four trenches used to dispose of spent ammunition, small spent rockets, and other metal scrap
- Evidence that burning was conducted in trenches

SWMU B-24 Historic Aerials



SWMU B-24

Investigations to Date

- 1995: EM-31 Geophysical survey
- 1997: Four disposal trenches where excavated to 15 feet, material sifted, soil samples collected
- 2000: Surface and subsurface soil samples collected
- 2008: Suspected 5th trench investigated and surface soil samples collected
- 2009: Geophysical survey and Eco Work Plan, some brass recycling of pile
- 2010: MEC Hazard Assessment and Technology Assessment

SWMU B-24

MEC Findings

Over 1,500 surficial and subsurface MEC items found including:

- Small arms ammunition
- Projectiles ranging from 20mm, 75mm (~95%)
- Hand grenades (~3%)
- Various fuzes (~2%)

In summary:

- Majority small arms and 20mm
- Occasional hand grenades require higher level of safety precautions

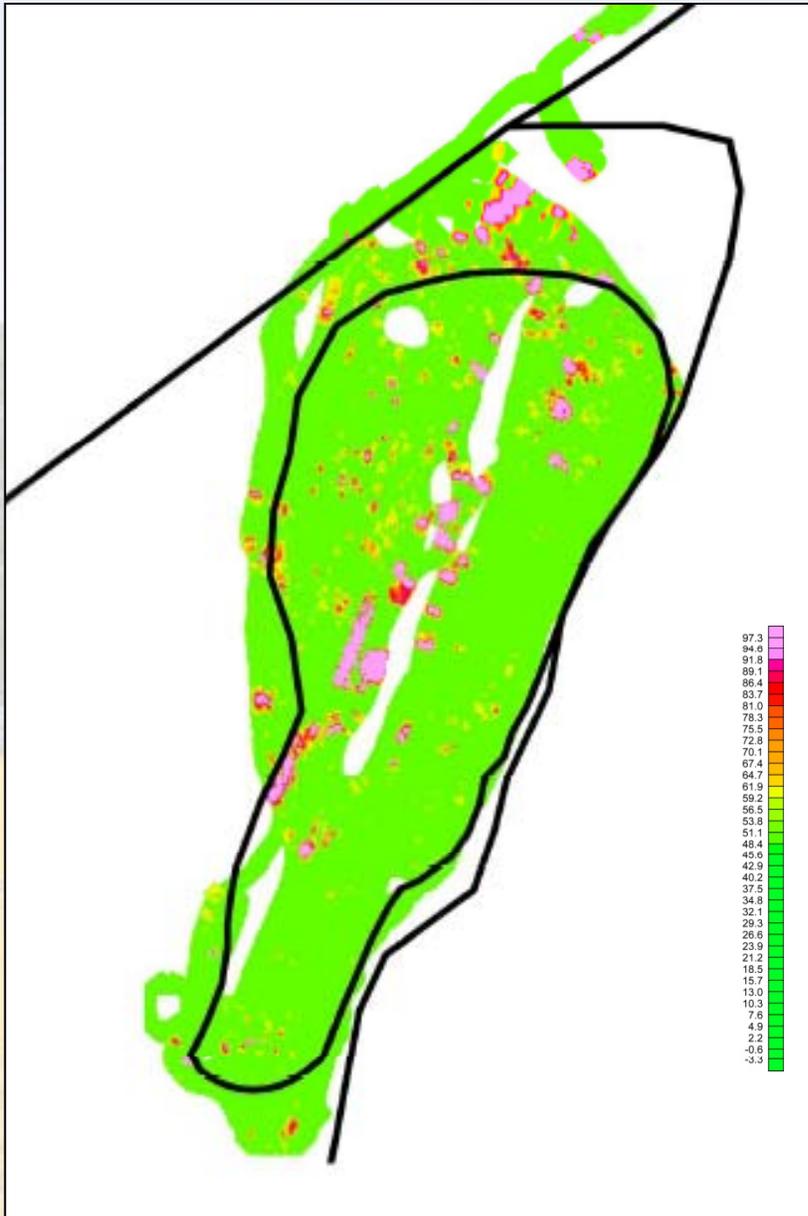
SWMU B-24 MC Findings



- Soil sampling shows MC above background, but generally below Tier 2 criteria – a few hot spots
- Eco criteria lower and may require some soil removal
- Hot spot at bras casing/rock pile

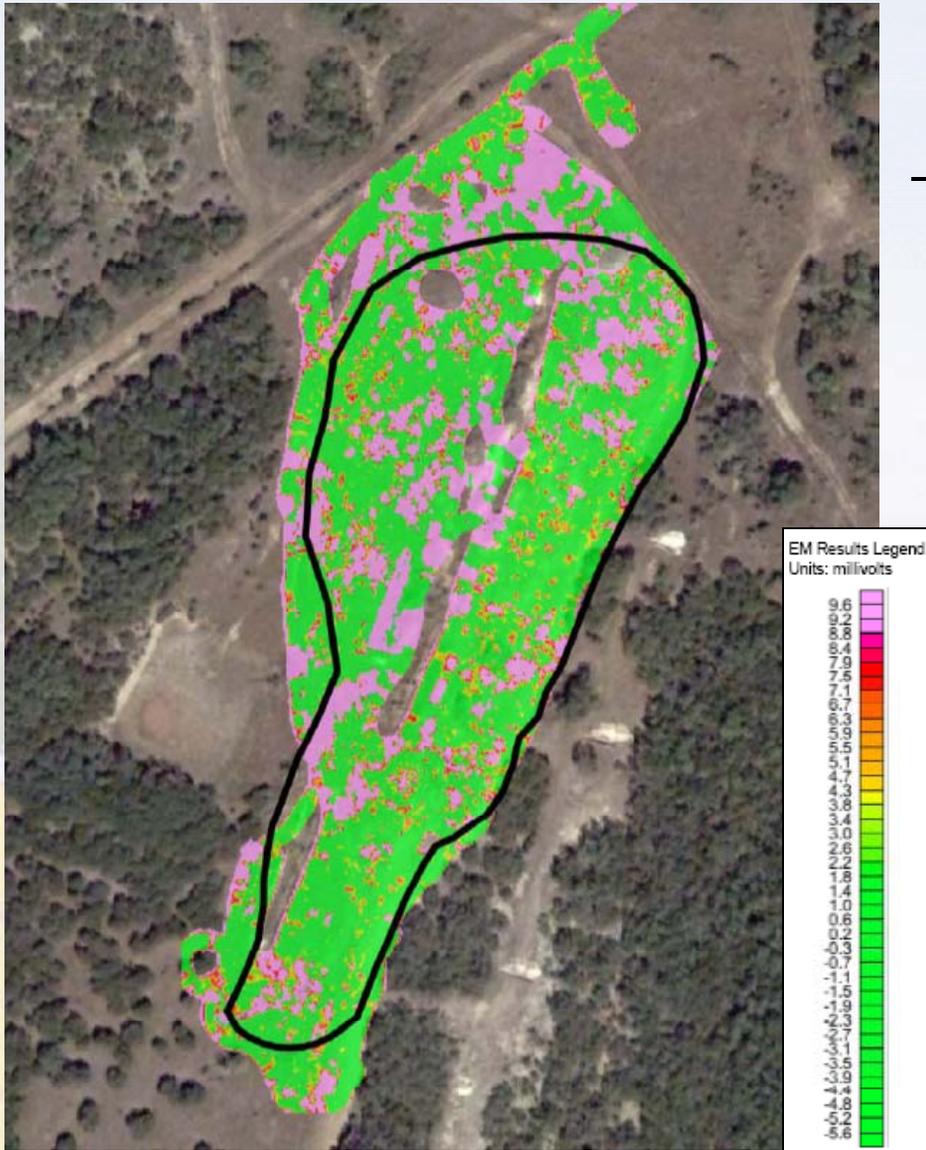
SWMU B-24 Geophysical Survey

- 100-millivolt threshold (*not suitable for size of munitions found at site*)



SWMU B-24 Geophysical Survey and MEC HA

- 10-millivolt threshold
- Lots of small arms MD visible across ground surface
- MEC HA score: 770
Hazard Level: 2



SWMU B-24

Bottom Line

- Soil sampling shows MC above background, but generally below Tier 2 criteria – a few hot spots
- 2009 Geophysical survey shows numerous anomalies located throughout the site
- SWMU B-24 has a total MEC HA score of 770, which corresponds to Hazard Level of 2
- Majority of MEC found is 20mm and small arms ammunitions. Hand grenades also present.

SWMUs B-20/21 and B-24

Remedial Action Alternatives

- No Action
- Access Restriction
- Surface Removal
- Surface Removal with Access Restriction
- Removal to Depth

Evaluation Factors

- Individual MEC Hazard Assessments
- Relative Costs
- Regulatory Acceptability
- Compatibility with Current Land Use Practices

Decision Matrix

Remedial Action Alternative	B-20/21 Change to Hazard Assessment		B-24 Change to Hazard Assessment		Relative Costs	Regulatory Acceptability	Compatible with Current Land Use Practices	Long-term Practicality
	Score	Level	Score	Level				
No Action	840	1	770	2	Low		√	
Access Restriction	800	2	730	2	Low		No	
Surface Removal	575	3	505	4	Moderate		√	
Surface Removal with Access Restriction	535	3	465	4	Moderate		No	
Removal to Depth	445	4	375	4	High		√	

Remediation Technology Alternatives

- Digital Mapping (DGM) and Anomaly Excavation
- Analog Identification and Anomaly Excavation
- Surface Scraping and Soil Sifting

Remediation Technology Alternatives

DGM Method

- Conduct a geophysical survey to determine where to deploy teams to manually excavate each registered anomaly

Analog Method – Mag & Dig

- Teams use hand-held analog detectors to detect individual anomalies for excavation
- Used at SWMU B-20/21 during 1995/1996 investigation. Found to be too labor intensive for use on a large scale at heavily MEC contaminated areas, such as the north portion of the SWMU

Scraping and Soil Sifting

- The soil column is excavated to a pre-determined depth using heavy equipment. The excavated soil is sifted to separate out the MEC and then either returned to the site or disposed of off-site.
- Used at both SWMU B-20/21 and B-24 in 1997 removal efforts. Some difficulty experienced with high clay content soils under high moisture conditions.

Treatability Study

Objectives

- **Test alternatives so that they can be better compared with respect to cost, effectiveness, etc.**
- **Identify methods to increase effectiveness, lower cost, etc.**
- **Example Questions to Address**
 - Which remediation technology or combination of technologies work best for each site?
 - Where do most of the MEC occur – surface or subsurface?
 - What are the costs for each removal technology and how do they compare?
 - What type of QC should be included to ensure that the remediation method is effective?
 - Are additional measures necessary to ensure technology works, such as drying of soils before sifting?
 - How will “overages” such as rocks and brass casings be handled?

SWMU B-20/21

Full Scale Project Estimate

Project Components

- A mix of removal technology will be used (DGM, mag & dig, and scraping and sifting)
- Prescribed burn on 100% of site
- Manual vegetation clearance on 5% of site
- Mechanical vegetation clearance on 5% of site
- 20% of the site will be Scraped to 1 foot, then DGM
- 60% of the site will be excavated to varying depths:
 - Scenario 1: 1 ft.
 - Scenario 2: 2 ft.
 - Scenario 3: 3.1 ft, (average depth to bedrock)
- 20% of the site will be cleared using mag & dig

General Cost Estimates

Scenario 1 —→ \$14,281,216

Scenario 2 —→ \$23,949,424

Scenario 3 —→ \$34,616,558

North Pasture

Next Steps

- Complete Technology Assessment
- Plan and Conduct Treatability Study
 - Divide site(s) up into areas of concern to facilitate investigation and closure

Schedule Overview

Event/Deliverable Description	2010												2011
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN
Technical Interchange Meeting		◇					◇					◇	
Site Investigations													
AOC 67/68 RIR Submittal			◇										
SWMU B-2/SWMU B-8 Investigation							▽						
SWMU B-15/16 Investigation						▽							
SWMU B-4 Investigation									▽				
SWMU B-201/24 Technology Assessment					▽								
Groundwater Monitoring													
DQO Update													
LTMO Update													
New Well Survey													
B-3 Bioreactor Treatability Study													
Monthly/Quarterly Monitoring													
New Extraction Well Installation													
Additional Shallow Well Instalation													
Tracer Study													
AOC-65 SVE Treatability Study													
Monthly/Semi-Annual Monitoring													
Technology Assessment													
Thermal-Enhanced SVE Pilot Study													

- ◇ Events
- ▽ Deliverables
- Duration