MEETING MINUTES

OVERVIEW			
CLIENT	Camp Stanley Storage Activity	PROJECT	Task Order TO11
MEETING DESCRIPTION			
SUBJECT	Regulatory Meeting	LOCATION	CSSA
MEETING DATE	6/5/2019	REPORT AUTHOR	Shannon Schoepflin
MEETING TIME	9:00 AM Central	REPORT DATE	6/14/2019

ATTENDEES

CSSA/Army	Regulators	PARSONS
Margarita Loya	Greg Lyssy, USEPA Timothy Brown, TCEQ Jorge Salazar, TCEQ Kaitlyn McCarthy, TCEQ	Laura Arciniaga Adrien Lindley Scott Pearson Ken Rice Shannon Schoepflin

TOPICS

Topics discussed included: updates on groundwater monitoring, solid waste management unit (SWMU) B-3 remediation, area of concern (AOC)-65 remediation; and remaining open sites. The slide presentation and sign-in sheet are attached. Discussion points are listed below:

Groundwater Monitoring Update

• Mr. Pearson provided an overview of the groundwater sampling program and sampling that has been conducted since the last regulatory meeting in October 2018, and presented several charts showing the impact of recent precipitation on groundwater levels and contaminant concentrations.

SWMU B-3 Remediation Update

- Mr. Lindley presented the results of bioreactor groundwater sampling since the last regulatory meeting held in October 2018 and outlined upcoming sampling and operations through July 2020.
- Slide 28: Mr. Salazar asked if the future plume map insets can all have aerial backgrounds for scale and reference.
- Mr. Lyssy commented about the analytes list for bioreactor and suggested we should consider evaluating the list and dropping unnecessary analytes.

AOC-65 Remediation Update

- Mr. Lindley summarized recent in-situ chemical oxidation (ISCO) monitoring activities at AOC-65, data collected since the deployment of the permanganate cylinders at AOC-65, and upcoming sampling and cylinder deployment plans.
- Mr. Lyssy commented about the low volatile organic compound (VOC) levels in the underground injection control (UIC) bioreactor recovered groundwater and the possibility of adding an extraction point at AOC-65.

Discussion Following Completion of the Slide Presentation

- Mr. Lyssy asked if the perfluoroalkyl substances (PFAS) report in the Environmental Encyclopedia (EE) and commented that if it isn't, it should be added.
- Mr. Lyssy asked if there is community interest or has it been recently expressed for a public meeting. We don't need to have one before the 5-year review but could schedule a meeting after the 5-year review report if there is interest. This would include sending out postcards with a link to the 5-year review and including information in the annual fact sheet.

- Ms. McCarthy (TCEQ) suggested the use of social media (nextdoor app) to communicate with public.
- Next regulatory meeting: Next year before/during 5-year review draft report. Mr. Lyssy feels there is no need for a meeting prior to that.

MINUTES DISTRIBUTION

Greg Lyssy, Timothy Brown, Jorge Salazar, Margarita Loya, Julie Burdey, Brenda Shirley

Sign in Sheet

DATE: June 5, 2019 TIME: 9:00 a.m.

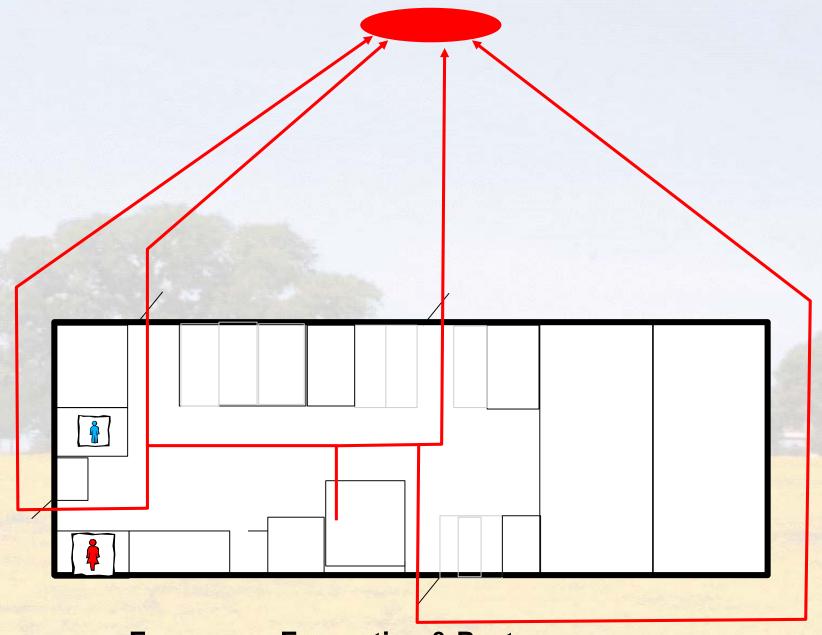
PLACE: CSSA

PRINTED NAME	Telephone	Email	SIGNATURE
Laura Arciniuga	512.719.6855	Pasuns com	200
margarita loga	210-240-0146	Loyanor Cessam	q. Cur
Ken Rice	512 119-6050	V	
Shannon Schoepflin	512-848-5284	Ken. r. rice oparsons. com & pour sons. com Shannon. Schoupflin	
GREG LY 55%	214 543 4415	LY551.68 00 RY @ EPA.60	
Adrien Lindly	512 560 9145	adricer lindly D. Person	
Tinothy Brown	512 239 6526	Timothy. Brown & treq. teas.	
Jorge Sular	210-403-4059	lorge . Salazoro teap tex	1 -0
Kaitlyn McCarthy	210-326-5698		
Scott Pearson	512-719-6087	Scot. pearson @ parsons com	Set Plean
			Great 1 co

Camp Stanley Storage Activity Status Update

June 5, 2019

INTRODUCTIONS AND WELCOME



Emergency Evacuation & Restrooms

Agenda

Introductions

Groundwater Monitoring

Monitoring Results Update

SWMU B-3

- Monitoring Results Update
- Operations, Maintenance, and Monitoring

AOC-65

- ISCO Results Update
- Recent Observations

Munitions Sites at CSSA

North Pasture

Open Discussion

GROUNDWATER MONITORING

Environmental Acronyms

<u>Geology</u>

UGR - Upper Glen Rose Limestone

LGR - Lower Glen Rose Limestone

BS - Bexar Shale

CC - Cow Creek Limestone

Wells

EXW - Extraction Well

IIW - ISCO Injection Well

MW – Monitoring Well

PZ - Piezometer

SIW – Steam Injection Well

VEW - Vapor Extraction Well

WB - Westbay Multi-port Well

Chemistry

AL – Action Level

MCL - Maximum Contaminant Level

NTU – Nephelometric Turbidity Units

RL – Reporting Limit

SCL – Secondary Contaminant Level

Geographic Codes

CS - Camp Stanley

FO - Fair Oaks

JW - Jackson Woods

LS - Leon Springs

RFR - Ralph Fair Road

OFR – Old Fredericksburg Road

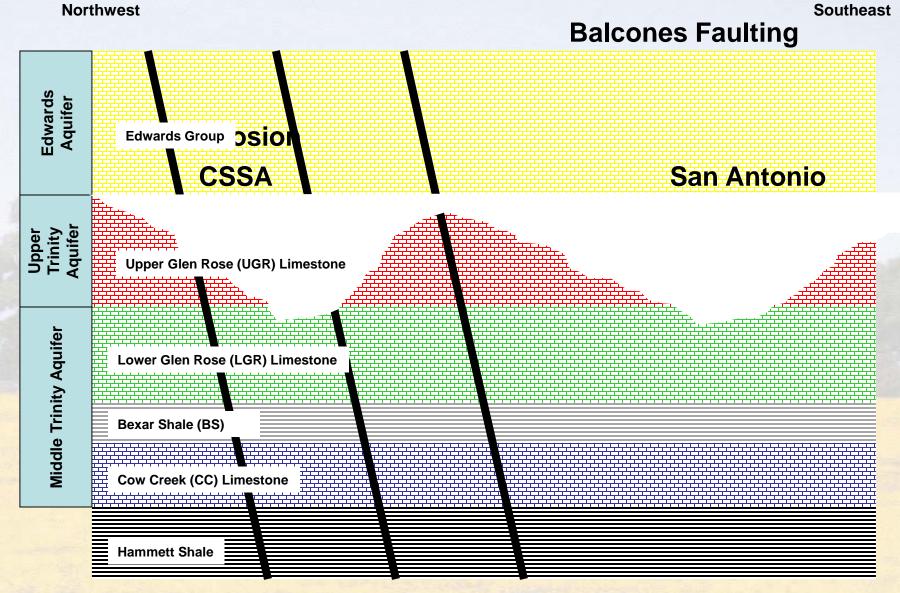
Other

GAC - Granular Activated Carbon

LTMO – Long-term Monitoring Optimization

WS - Weather Station

Geologic Setting



Groundwater Monitoring Program Overview

- Quarterly monitoring program:
 - On-post since December 1999: 78 events
 - Off-post since September 2001: 71 events
- Available well monitoring network includes:
 - 4 On-post drinking water supply wells
 - 46 On-post monitoring wells
 - 45 Bioreactor wells (including 27 multi-port zones in Westbay wells)
 - 56 Off-post private and public supply wells
 (6 off-post wells have GAC units due to past exceedances)
- CSSA has refined the monitoring program through a series of LTMO processes in 2005, 2010, and 2015
- The groundwater program is currently following the 2015 LTMO recommendations

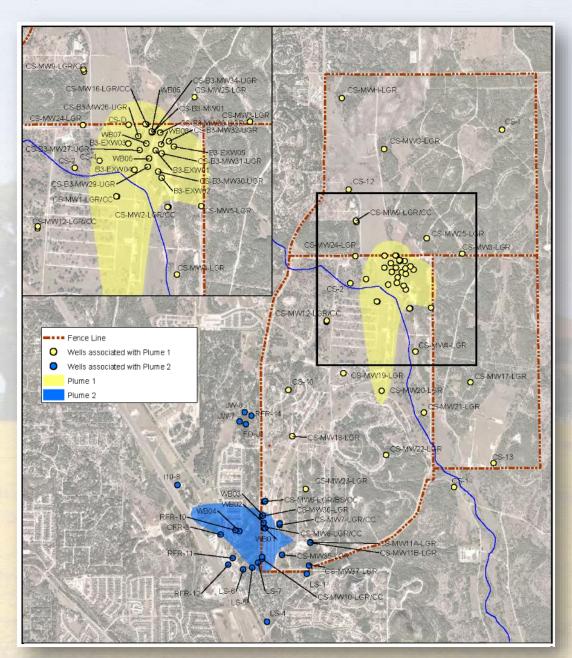
2015 Long-Term Monitoring Optimization (LTMO)

The updated 2015 DQOs and LTMO were submitted to the TCEQ in January 2016. Both documents were approved for implementation by May 2016.

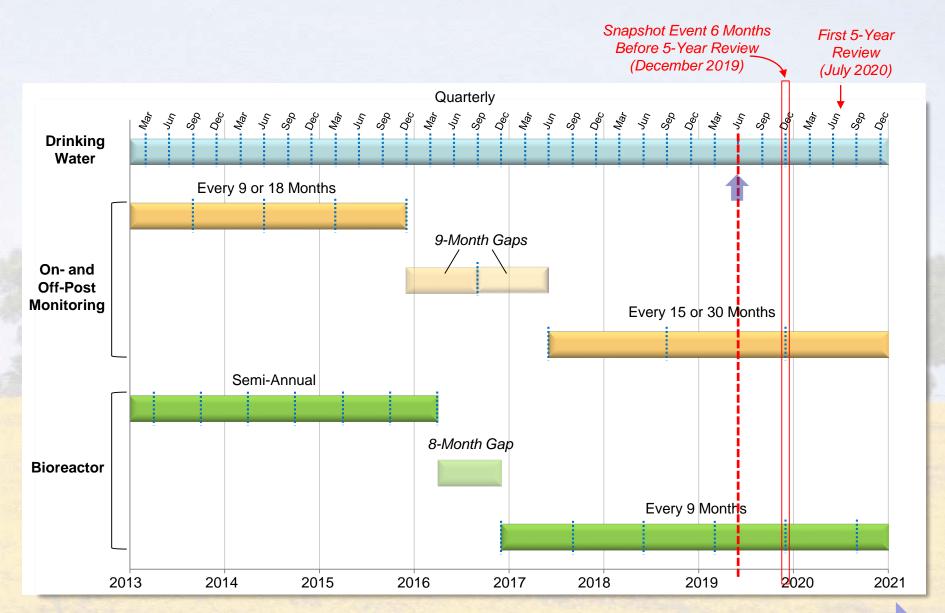
	Sampling Points (Well or WB Zone)	Previous Frequency	2015 LTMO Frequency
On-post Drinking Water Wells	4	Quarterly	Quarterly
Off-Post Wells w/ GACs	6	Quarterly	Quarterly
On-Post and Off-Post Wells	56	Every 9 months	Every 15 months
On-Post Wells	38	Every 18 months	Every 30 months
Bioreactor Wells	42	Every 6 months	Every 9 months

- Based on the revised LTMO and DQOs, 10 off-post wells were excluded following the **December 2018** monitoring event after 5 consecutive years of ND results
- A "snapshot" event of all wells will occur in **December 2019**, six months before the first 5-year report due in July 2020

On- and Off-Post LTM Wells

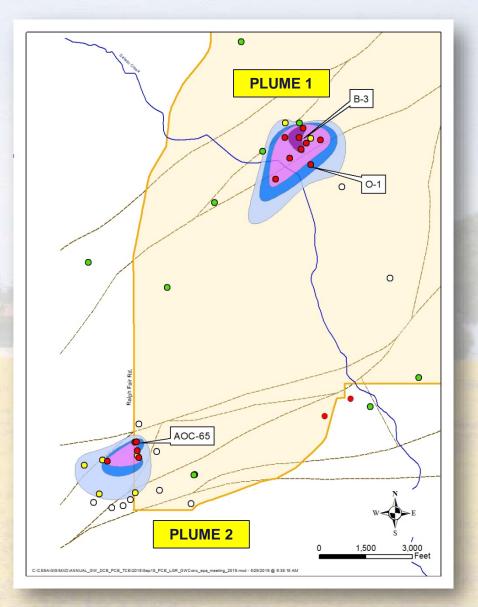


LTMO Transition



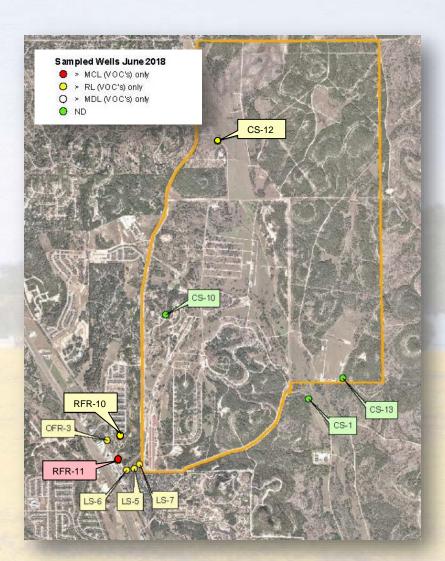
Groundwater Monitoring Program General Facts

- Plume 1 originates from SWMUs B-3 and O-1 in the Inner Cantonment
- Plume 2 originates from AOC-65 in the SW corner of CSSA
- A "snapshot" event (all LGR and offpost wells sampled simultaneously) occurs every 9 months under the 2010 LTMO, and transitioning to every 15 months under the 2015 LTMO
- September 2018 was the first 15month snapshot event. December 2019 will be the next 30-month snapshot event (including all LGR, BS, and CC wells)



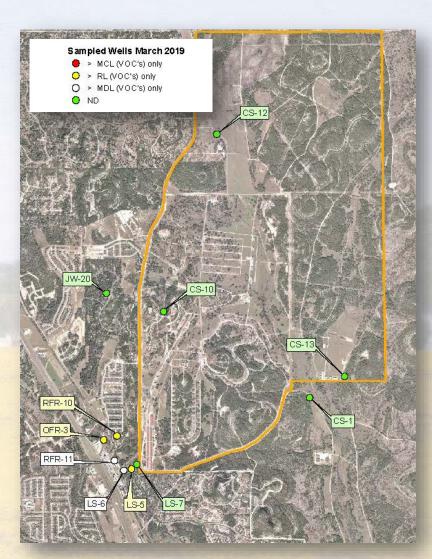
Groundwater Monitoring Program December 2018 Results Overview

- This event included 4 On-post and 6 Off-post wells
 - Supply wells CS-1, CS-10, and CS-13 had no detections of VOCs. All metals in supply wells were below ALs, MCLs, SCLs
 - 1.83 µg/L PCE was reported in supply well CS-12. The well was re-sampled in January 2019 with no VOC detections.
 - Only Off-post private well RFR-11 exceeded the MCL for PCE (8.73 µg/L)
 - Off-post wells LS-5, LS-6, LS-7, OFR-3, and RFR-10 all had detections of either PCE or TCE below the MCL, but greater than the RL
 - All GAC units were sampled, and no VOCs were detected in the treated groundwater



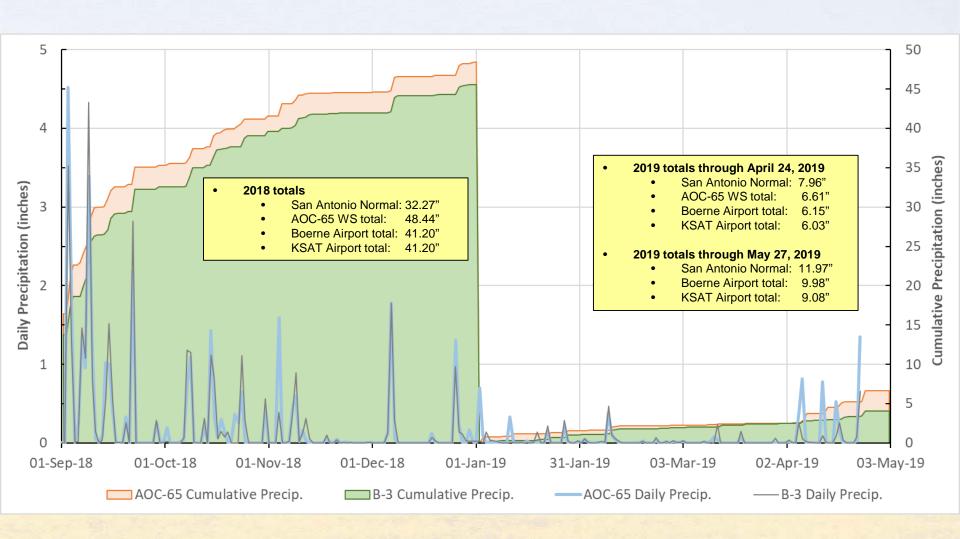
Groundwater Monitoring Program March 2019 Results Overview

- This event included 4 On-post and 6 Off-post wells
 - Supply wells CS-1, CS-10, CS-12, and CS-13 had no detections of VOCs. All metals in supply wells were below ALs, MCLs, SCLs
 - Off-post wells LS-5, LS-6, LS-7, OFR-3, RFR-10, and RFR-10 all had detections of either PCE or TCE below the MCL, but greater than the RL
 - Off-post well JW-20 was sampled for the final time to reach 5 years of non-detect results. This well will be excluded from the scheduled LTMO program.
 - All GAC units were sampled, and no VOCs were detected in the treated groundwater



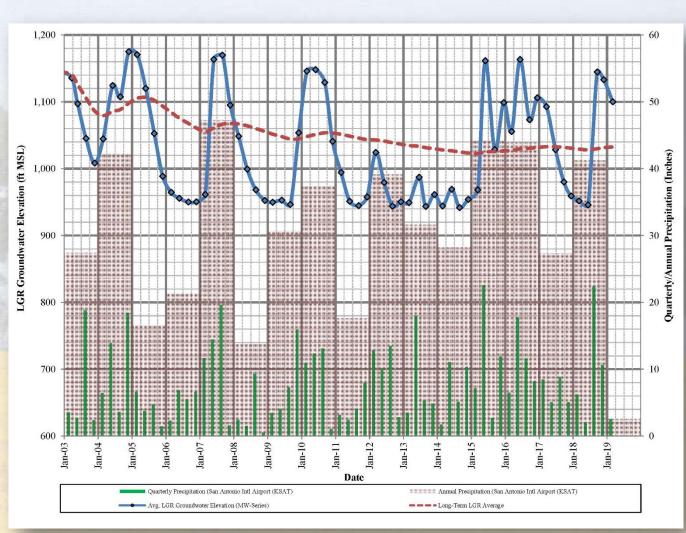
2018 Precipitation Overview

September 2018 through April 2019



Historical LGR Groundwater Elevation and Precipitation at CSSA June 2003 through March 2019

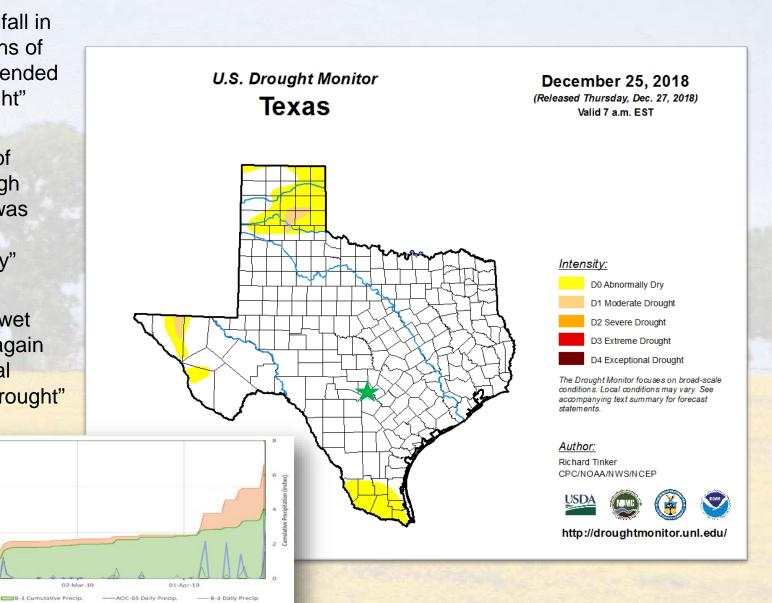
- July-September 2018
 has been the 2nd wettest
 quarter since 2003
 (~22"), and continued
 into October with another
 6.5"
- Only 6.7" of rain has fallen between November and March
- In response, the Middle Trinity aquifer dropped 45 feet in the LGR interval through March
- Bexar Shale groundwater has risen
 19 feet through March
- Cow Creek groundwater has risen 9 feet through March



Central Texas Drought Status

- With 33" of rainfall in the last 6 months of 2018, the year ended in a "No Drought" Status
- With only 2.5" of rainfall in through March, CSSA was returning to "Abnormally Dry" status
- Unseasonably wet April/May has again returned Central Texas to "No Drought" Status

AOC-65 Cumulative Precin



CS-12 Pump Replacement

- Production pump was installed in 2009
- As a preventative maintenance operation the pump was replaced in May 2019
- Column pipe and pump were corroded but the integrity of both were still intact
- Equipped with a new pump and all new column pipe, disinfected per AWWA standards, and chlorine dosed for more than 48 hours
- After purging the groundwater to remove any residual chlorine and turbidity, two BACT samples were collected per AWWA
- No coliform presence was found in the groundwater
- Returned to service on May 24, 2019



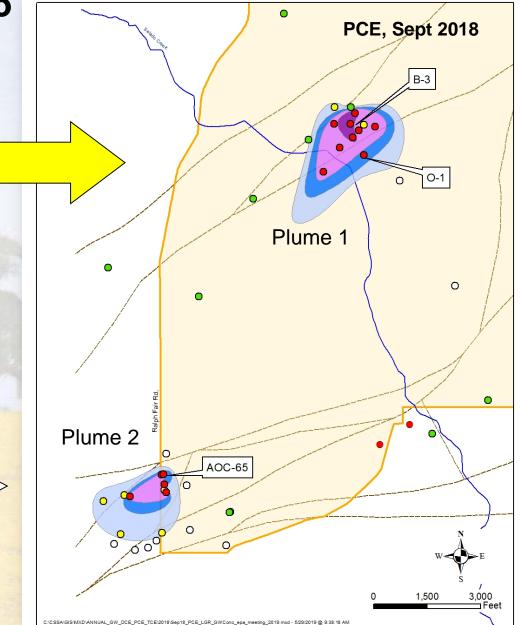
CORRECTIVE MEASURES UPDATES: SWMU B-3

SWMU B-3 and AOC-65

SWMU B-3 Bioreactor:

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

AOC-65 ISCO Treatment: Destruction of chlorinated hydrocarbons in underlying fractured limestone at Plume 2.



SWMU B-3 SOURCE AREA TREATMENT: BIOREMEDIATION

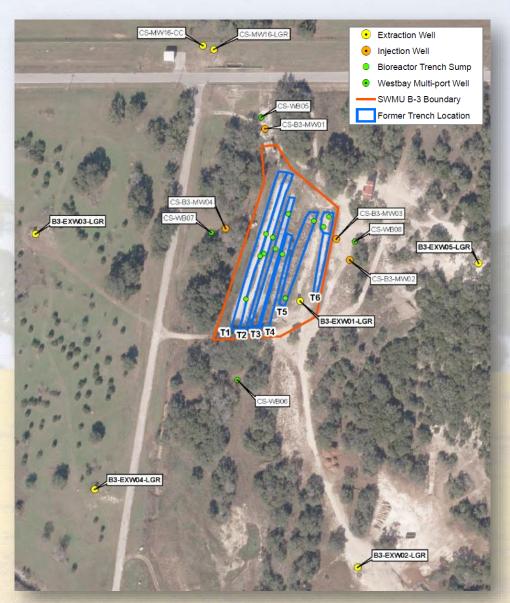
Bioremediation: Use of organisms to neutralize contamination



B-3 Bioreactor Summary of Recent Activities

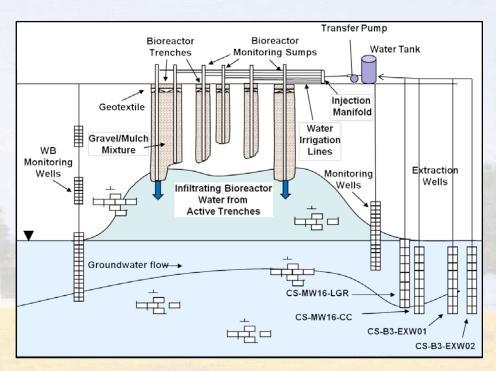
Continued Bioreactor Operations

- Application of extracted VOCimpacted groundwater to trenches
- Quarterly and Semi-Annual Regulatory Sampling
 - Quarterly UIC sampling of extracted water prior to bioreactor application
 - Semi-annual sampling of Trench Sumps and Westbay wells (LGR-03B zones)
- Performance Sampling (9-month):
 March 2019
 - Remaining WB well zones and surrounding LGR and UGR MWs
- Annual Reporting UIC notification/ Performance Report: May/July 2019
- Well Maintenance Pump replacements and well development



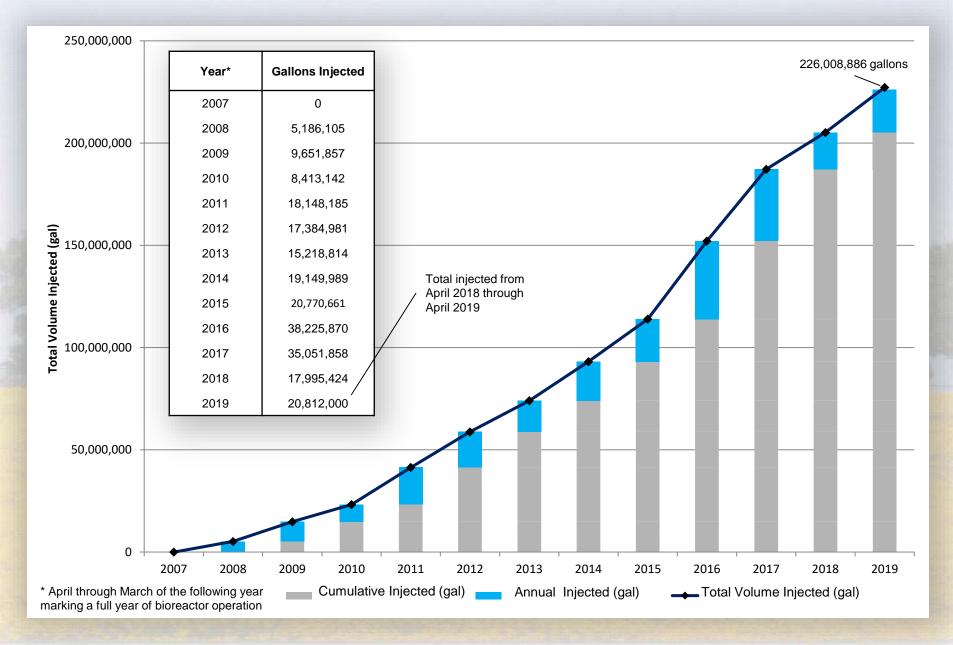
SWMU B-3 Bioreactor

- VOC degradation is occurring with biological degradation end products methane, ethene, ethane, and CO₂ identified in surrounding UGR wells and LGR wells
- Bioreactor maintains appropriate geochemical conditions (low DO, ORP, and pH) for effective anaerobic dechlorination
- From mid-September 2018 to April 2019 (since our last meeting), approximately 16,000,000 gallons of groundwater were extracted and injected into Trenches 1, 2, and 6
- Approximately 226,008,886 gallons of extracted groundwater have been injected into the bioreactor



Bioreactor Conceptual Diagram

SWMU B-3 Bioreactor



SWMU B-3 Bioreactor O&M

Well	Production May 2018 – April 2019	Pump Status (1/2/18 – Present)
16-CC	2,929,000 gal	Online May 2018 - Present
16-LGR	1,127,000 gal	Offline February – May 2019: loss of phase and contactor failure; Pump replaced May 2019
EXW01	2,951,000 gal	Pump replacement April 2018; Online April 2018 - Present
EXW02	707,000 gal	Offline June 2018 – May 2019: low power fault and overcurrent; Pump replaced May 2019
EXW03	5,133,000 gal	Pump replaced and well redeveloped May 2018; Online May 2018 - Present
EXW04	2,983,000 gal	Offline February – May 2019: high turbidity and overcurrent; Pump replaced and well redeveloped May 2019
EXW05	4,982,000 gal	Online May 2018 – Present

Total = 20,812,000 gal

Well	Injection	Well Status
B3-MW01	NA	Well redeveloped May 2019

SWMU B-3 Bioreactor

Operations, Maintenance, and Monitoring

- Continue monitoring bioreactor and surrounding wells for UIC permit and performance parameters
- Continue monitoring and maintenance activities for delivery of groundwater to the trenches
- Conduct semi-annual (Jun/Sept 2019) and 9-month monitoring (Dec 2019)
- Continue UIC monitoring with annual report in July 2020
- Continue SCADA control and automation integration
- Solar Grid at EXW-02 integrated/ operational (Mar 2019)



B-3 Bioreactor Current Sampling Efforts

Regulatory Sampling

- VOCs
- TDS
- pH at injection site (field)

Performance Sampling

- MEE + CO₂
- Ferrous Iron
- Manganese
- Arsenic
- Total Organic Carbon
- Sulfide
- Sulfate and Chloride
- Dehalococcoides
- Dissolved Hydrogen

Regulatory Sampling Locations

- Injection Manifold (UIC) Quarterly
- Trench Sumps Semi-Annual
- WB-03B Zones Semi-Annual

Performance Sampling Locations Frequency: Every 9 months

- Trench Sumps (5)
- WB zones (27)
- Extraction Wells (7)
- LGR Monitoring Wells (4)
- UGR Monitoring Wells (9)

Trench Sump Field Parameters

Frequency: Monthly

pH

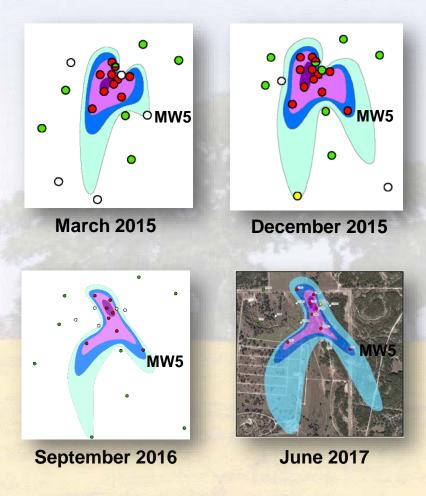
• ORP

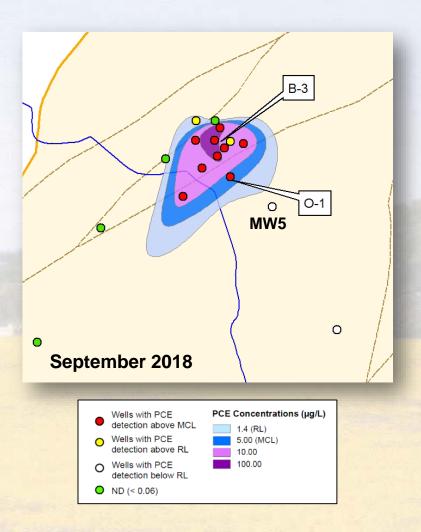
• DO

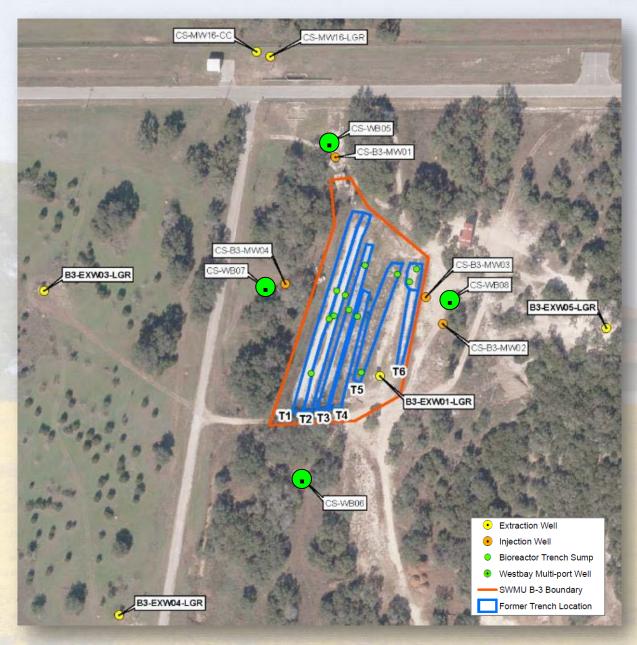
- Temp
- Conductivity
 Water Level

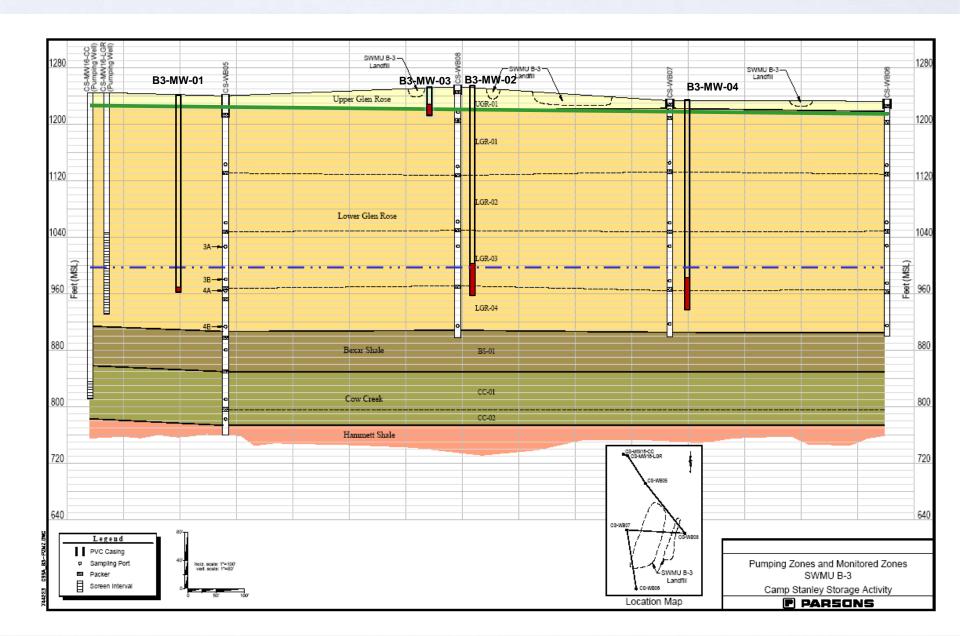
SWMU B-3 Bioreactor

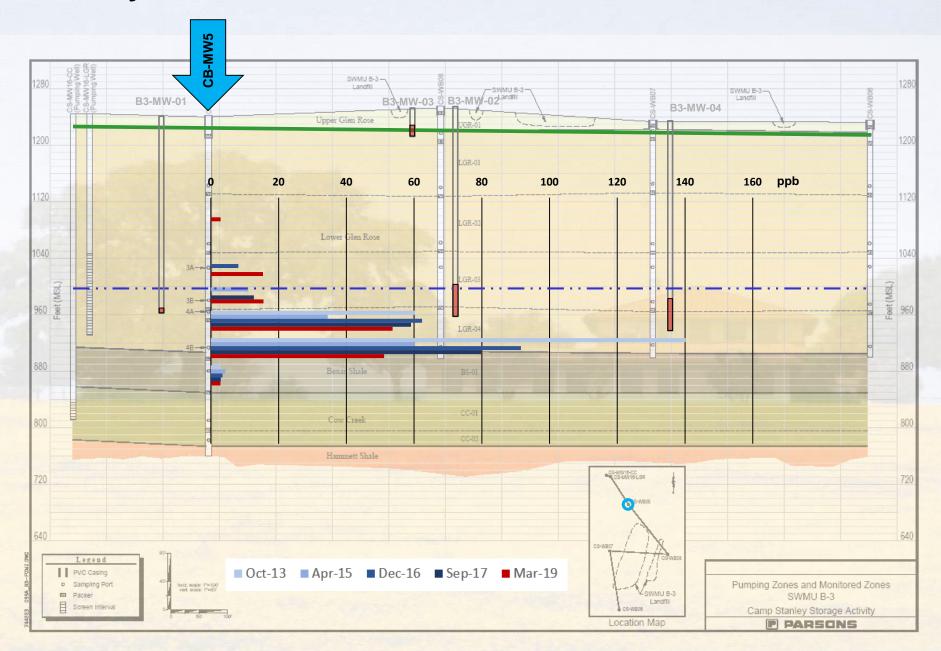
Extent of LGR PCE Plume



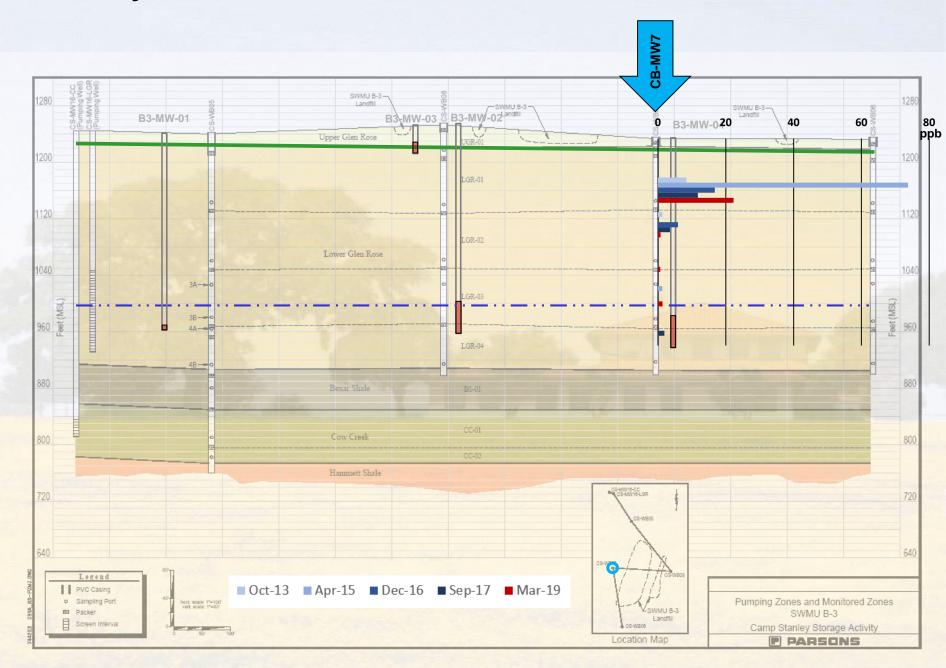




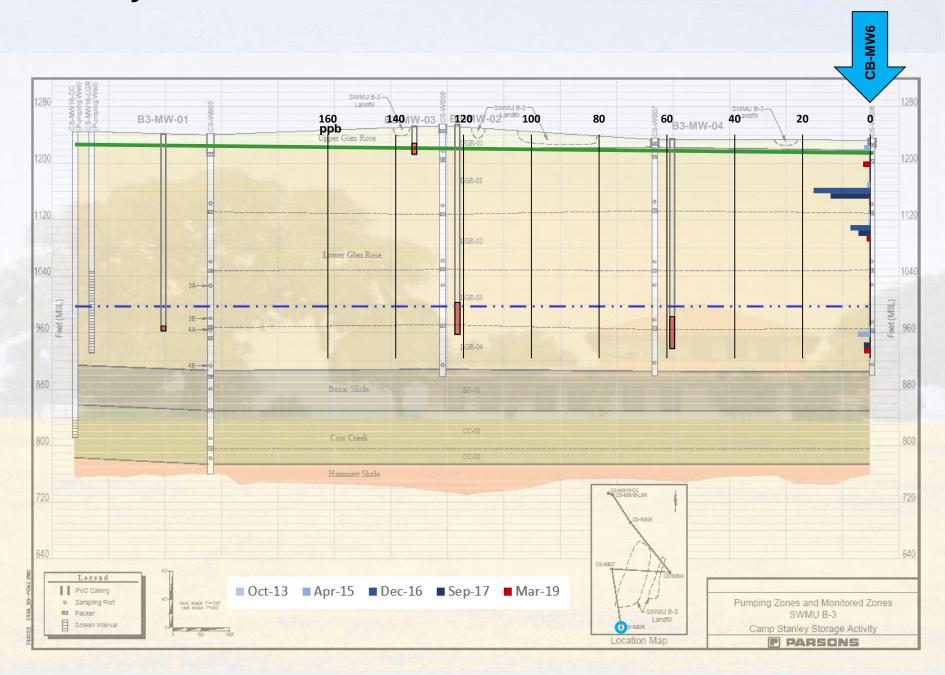




Vinyl Chloride Concentrations Beneath the Bioreactor CB-MW8 1280 40 60 100 120 128140 B3-MW-02 and ppb B3-MW-01 B3-MW-03 Upper Glen Rose LGR-01 Lower Glen Rose 1040 LGR-04 880 880 800 800 CS-MW16-CC CS-MW16-LGR 720 640 ■ Oct-13 ■ Apr-15 ■ Dec-16 ■ Sep-17 PVC Casing Pumping Zones and Monitored Zones Sampling Port m Packer SWMU B-3 Camp Stanley Storage Activity P PARSONS



Vinyl Chloride Concentrations Beneath the Bioreactor



SWMU B-3 Bioreactor

Next Steps

- Replenish Mulch in Trenches 1 and 2
 - Plan to mix in fresh mulch/gravel with existing, reset injection lines (new and old), and replace geotextile fabric
- Substrate injections
 - Injection well B3-MW01 recently re-developed and available for subsequent injections
 - Consider lactate injections within Trenches 1 and 2 following mulch replenishment to rapidly return geochemical conditions to anoxic/anaerobic

SWMU B-3 Bioreactor

Upcoming Sampling and Reporting

 Quarterly UIC March 2019 Semi-Annual UIC June 2019 Quarterly UIC **July 2019** Annual Reporting Quarterly UIC September 2019 Semi-Annual UIC Quarterly UIC December 2019 9-Month Performance Monitoring Quarterly UIC March 2020 Semi-Annual UIC June 2020 Quarterly UIC First Five-Year Review July 2020 Annual Reporting

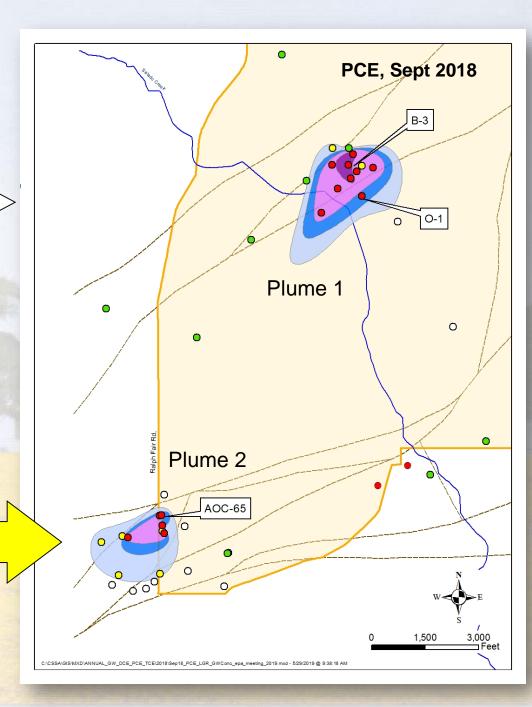
CORRECTIVE MEASURES UPDATES: AOC-65

SWMU B-3 and AOC-65

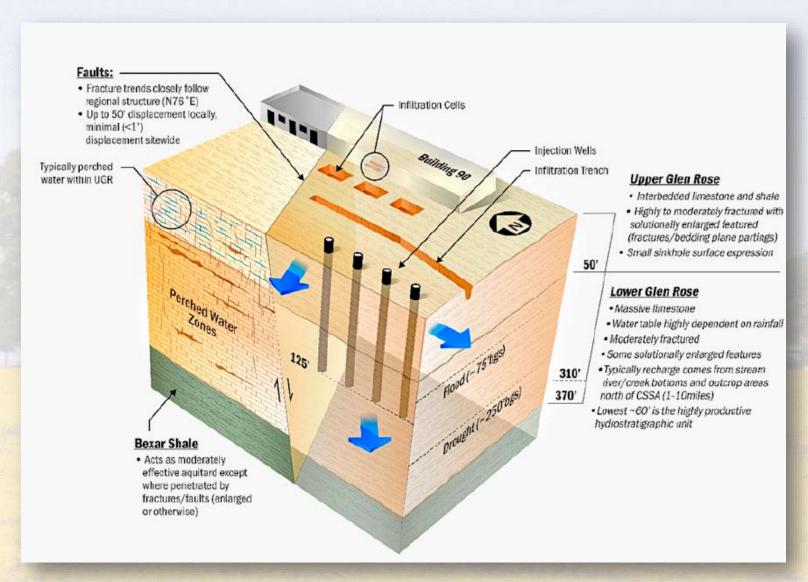
SWMU B-3 Bioreactor:

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

AOC-65 ISCO Treatment: Destruction of chlorinated hydrocarbons in underlying fractured limestone at Plume 2.



AOC-65 Conceptual Site Model

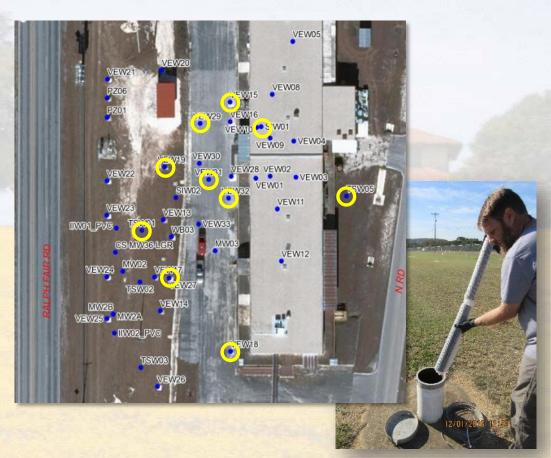


AOC-65 Source Area Treatment

In-Situ Chemical Oxidation (ISCO) selected corrective measure for VOC-impacted groundwater at AOC-65 with a phased approach initiated in 2012

ISCO Cylinders

- Provide a continuous oxidant source
- Installed within multiple locations at AOC-65
- Oxidant distributed under varying hydrologic conditions
- Consist of long-lived permanganate and higher oxidation potential persulfate



AOC-65 ISCO Summary of Recent Activities

ISCO Cylinder Installations

- Spent Permanganate cylinders replaced with 18 new Permanganate/persulfate cylinders (Oct. 2018)
- Additional 12 cylinders installed within four AOC-65 wells (Nov. 2018)
- Liquid permanganate injections (Jan. 2019):
 - ISCO Injection Wells (IIW): IIW-01, IIW-02, and IIW-04 received 50, 25, and 25 gallons of 6.6% permanganate
 - Infiltration Cells: North Injection Cell (NIC) and Middle Injection Cell (MIC) each received 250 gallons of 6.6% permanganate solution

Quarterly Sampling

- Performance monitoring performed December 2018 and March 2019
- UGR wells (TSWs, VEWs, PZs) within AOC-65; and LGR wells (IIWs)
- Off-Post private supply wells (GACs installed)
- Annual Reporting UIC notification submitted in June 2019

AOC-65 ISCOCurrent Sampling Efforts

Quarterly Sampling Locations

- VEWs, TSWs, PZs, SIW-01
- WB01-03: UGR-01, LGR-01, LGR-09
- WB04: UGR-01, LGR-01, LGR-11
- 6 off-post GAC'd wells

Performance Analytes

- VOCs
- Anions:
 - Chloride and Sulfate
- Metals:
 - Ag, As, Be, Cd, Cr, Cu, Hg, Na, Ni, Pb, Sb, Se, Ti, Zn, Mg, Mn

Additional Sampling Locations Frequency: Every 15 months

- CS-MW06-LGR, 07-LGR, and 08-LGR, CS-MW36-LGR
- WB01 04 LGR zones (27)
 Frequency: Every 30 months
- WB04 BS/CC zones (5) and,
- WB04 LGR zones (3)
 Frequency: As needed
- IIW-01 through -04

Field Parameters

• pH

ORP

• DO

Temp

Conductivity
 Water Level

ISCO Applications

	Oxidant Application Phase		Volume and Type	Application/ Injection Location	
	Persulfate Solution	Phase I	~15,000 gallons	Infiltration trench and	
		-2012	20% sodium persulfate	SIW-01	
		Phase II	~34,000 gallons	Infiltration trench, SIW-01,	
		-2013	20% sodium persulfate	IIWs	
		Phase III	~106,000 gallons	Infiltration trench, SIW-01,	
		-2014	20% sodium persulfate	IWs	
-	Permanganate Solution	Phase IVa	~3,500 gallons 0.45%	Newly constructed infiltration cells	
		Phase IVb (2015)	~7,000 gallons 0.9%	(3 exterior, 2 vault)	
				TSWs, SIW-01, VEWs	
-		Phase IVc (2019)	~600 gallons 6.6%	IIWs, NIC and MIC	
	Permanganate Cylinders	Phase V 2016	12 permanganate-infused paraffin wax cylinders	SIW-01, TSWs -01 and -05, VEWs -19, -27, and -32	
		2017	6 permanganate cylinders and redistribution of existing cylinders		
		2018	Replaced 18 spent cylinders; installed 12 cylinders in four new wells	VEWs 15, 18, 29, and 31	

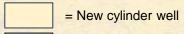
ISCO Observations

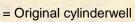
Following 2018 Cylinder Replacement

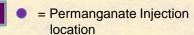
- PCE concentrations reduced to non-detect at 4 of 5 original wells (SIW-01 was ND prior to replacement).
- PCE concentration reductions in 3 of 4 new cylinder wells following installation (reductions at all four wells by Mar.)
- Increase in PCE concentration at one well following cylinder installation (VEW-29)
- Overall decrease in PCE concentrations indicate replacement of "spent" cylinders effective/necessary to maintain remedial objectives

PCE Concentrations Following 2018 Cylinder Replacement/ Installations and 2019 Injections

ſ		PCE Concentration (µg/L)							
	Well ID								
		Mar.	Jun.	_	Dec.	Mar.			
L		2018	2018	Sept. 2018	2018	2019			
	TSW-01	220	1,500	890	ND	ND			
	TSW-04	2.2	2.4	2.5	7.5	4			
	TSW-05	79	77	27	ND	3.9			
	TSW-06	2	2.4	2.6	23	7			
	TSW-07	0.8	5.6	4.2	5.6	3.2			
	SIW-01	190	1.5	ND	ND	ND			
	VEW-32	640	630	71	51	13			
	VEW-31	40	280	120	6.6	ND			
	VEW-29	33	74	21	32	0.21			
	VEW-27	0.53	100	11	ND	ND			
	VEW-25	5.2	8.7	5.6	10	13			
	VEW-19	0.4	0.75	13	ND	ND			
ı	VEW-18	5	83	35	7.7	0.57			
	VEW-15	9.9	16	30	ND	ND			
	MIC	210	8,300	362	290	ND			
ı	WB03-UGR-01	19,000	22,000	10,000	12,000	17,000			
	ND – Non-detect (below MDL)								
l,	IND - Notificated (below MDL)								









ISCO Observations

Following Liquid Injections

- Decrease in PCE concentration within MIC similarly demonstrates the necessity for periodic injections of liquid oxidant to continue treatment.
- Proximity of cylinder wells and infiltration cells shows complexity of flow at the site.
 - Anticipated more of an impact in PCE concentrations at nearby VEWs (29, 31, and 32) following NIC/MIC injections
 - Well screens begin at these wells at 5' bgs

AOC-65 ISCO Planned Activities / Next Steps

Continued ISCO Application

- Probable replacement of all cylinders (30)
- Possible Liquid permanganate injection in infiltration cells and IIWs

Continued Quarterly Monitoring

- June sampling in process:
 - UGR wells (TSWs, VEWs, PZs) within AOC-65
 - Off-Post private supply wells (GACs installed)
 - Additional wells infrequently sampled (IIWs and VEWs)
- September and December 2019 next sampling events
- Annual Performance Report February 2020
- Annual Reporting, UIC notification July 2020

REMAINING SITES AT CSSA

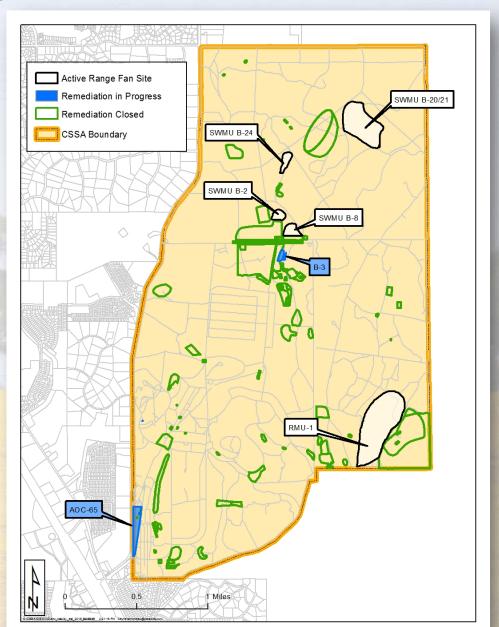
Remaining Open Sites at CSSA

North/East Pasture Sites

- 1. SWMU B-2
- 2. SWMU B-8
- 3. SWMU B-20/21
- 4. SWMU B-24

Groundwater Sites

- 5. AOC-65
- 6. SWMU B-3



QUESTIONS / DISCUSSION