MEETING MINUTES

OVERVIEW			
CLIENT	Camp Stanley Storage Activity		
PROJECT	Task Order TO9		
MEETING DESCRIPTION			
SUBJECT	Regulatory Meeting	**LOCATION**	CSSA
MEETING DATE	8/18/2016	**REPORT AUTHOR**	Shannon Schoepflin
MEETING TIME	1:00 pm Central	**REPORT DATE**	8/29/2016

ATTENDEES		
CSSA	**Regulators**	**PARSONS**
Felicia Kraintz James Cannizzo	Greg Lyssy, USEPA Amanda Pirani, TCEQ Jorge Salazar, TCEQ	Julie Burdey Scott Pearson Ken Rice Laura Arciniaga

TOPICS

Topics discussed included: status of Administrative Order documents; groundwater monitoring update; solid waste management unit (SWMU) B-3 remediation update; and area of concern (AOC)-65 remediation update. Slide presentation is attached. The slide presentation is attached. Discussion points are listed below:

Administrative Order Closure Documents

- Construction Quality Assurance Plan was recently submitted to USEPA.
- Corrective Measures Implementation (CMI) Report must be a standalone report. It can have existing document as attachments.
- Links to the Decision Document and Statement of Basis in the CSSA environmental website are currently to USEPA pages; however, USEPA has moved the documents, so the links no longer work. Mr. Lyssy indicated that we should add the documents to the CSSA website, instead of relying on USEPA links.

Groundwater Monitoring Update

- SAWS is planning on abandoning wells LS-1 and LS-4, which are part of our monitoring network.
  - CSSA is working with Leon Springs Compass Bank to sample well I10-10 as a replacement for the LS-4 downgradient monitoring point. An access agreement is in place, and it will be up for renewal in a couple of years.
  - CSSA and Parsons visited with the employees at the bank, and they said they will need to work through their corporate office. None of the current employees at that location were familiar with the access agreement.
  - If the bank doesn't work out, there is also a well at Leon Springs Dance Hall that could potentially be sampled.
  - CSSA will replace LS-1 with a new well on-post. It will be located near LS-1, but on-

post.

- The long-term monitoring optimization (LTMO) report has been finalized and approved by USEPA/TCEQ.

SWMU B-3 Remediation Update

- Mr. Lyssy supports our proposal to inject emulsified vegetable oil (EVO) and/or lactate at SWMU B-3, and to install additional UGR injection wells on the east side of the site.
- Mr. Rice explained we would inject EVO/lactate and then follow up with an injection of bioreactor water. Mr. Lyssy agrees with injecting more water into the system.
- Both Mr. Lyssy and Ms. Pirani indicated that a minimal plan is required for proposed SWMU B-3 work.
- A UIC permit modification will be requested for B-3 to go to a 9-month monitoring schedule (aligned with the revised monitoring schedule resulting from the latest LTMO). Currently the permit stipulates semi-annual and annual reporting.
- Mr. Rice described the challenges with installing the solar equipment at SWMU B-3. A power phase conversion is necessary, the system generates hydrogen gas when the batteries overcharge (safety concern), and the system was recently damaged by a lightning strike. Mr. Lyssy indicated that the solar power is not required from USEPA's perspective, but Ms. Kraintz indicated that CSSA will continue to work through the issues with it.

AOC-65 Remediation Update

- Discussed results of last year's permanganate injection. Permanganate lasts longer and some effects observed, but difficult to separate them from other natural changes in the system (primarily precipitation).
- It is difficult to see any decreasing concentration trends in off-post drinking water wells resulting from ISCO injections.
- A continuous long-term oxidant source will help to identify trends over time. Permanganate wax "candles" can provide a continuous source over a longer period than a single injection. Mr. Lyssy indicated that these are being used for Kelly AFB groundwater remediation.
- Mr. Lyssy suggested that a mix of locations for the permanganate wax (both high and low VOC concentration wells) may be beneficial.
- USEPA agrees that use of the permanganate wax is a reasonable next step at AOC-65.

RCRA 40th Anniversary

- Slide story with pictures and one sentence each.
- Mr. Lyssy will get back to us on format.

It was agreed that the next regulatory meeting would be held in approximately one year (summer 2017).

MINUTES DISTRIBUTION

Greg Lyssy, Amanda Pirani, Jorge Salazar, Felicia Kraintz, Julie Burdey, Brenda Shirley

Meeting: Environmental Program Status Mtg

Date: August 18, 2016

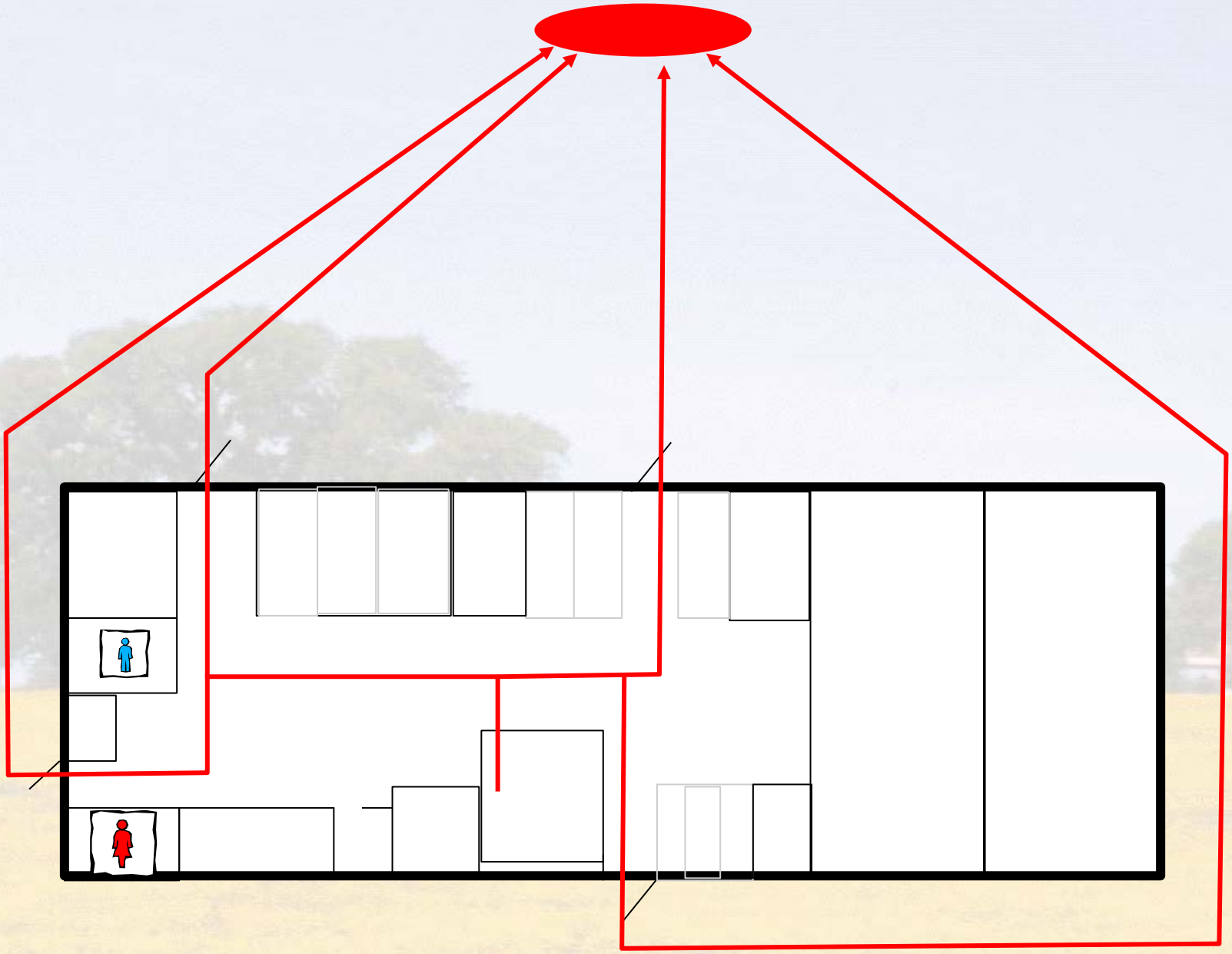
Sign-In Sheet:

Name		Company & Phone Number	Signature
Last	First		
Burdey	Julie	Parsons 512-719-6062	Julie Burdey
Salazar	Jorge	TCEQ-San Antonio 210-403-4059	Jorge E S
Pearson	Scott	Parsons 512-719-6087	Scott Pearson
Arciniaga	Laura	Parsons 512/719-6855	
Pirani	Amanda	TCEQ 512-239-6526	amanda Pirani
Kraintz	Felica	CSSA 2102957067	
Rice	Ken	Parsons 512-497-0075	
LYSSY	GREG	USEPA 214 665 8317	
Cannizzo	Jim	US Army 210 295-7082	

Camp Stanley Storage Activity Status Update

August 18, 2016

INTRODUCTIONS AND WELCOME



Emergency Evacuation & Restrooms

Agenda

EPA Order Documents

- Construction Quality Assurance Plan (CQAP)
- Corrective Measures Implementation (CMI) Report

Groundwater Monitoring

- Monitoring Results Update
- LS-1/LS-4
- Transition to New LTMO
- RFR-10

SWMU B-3

- Monitoring Results Update
- Lactate Injections
- New Well
- Solar Panels

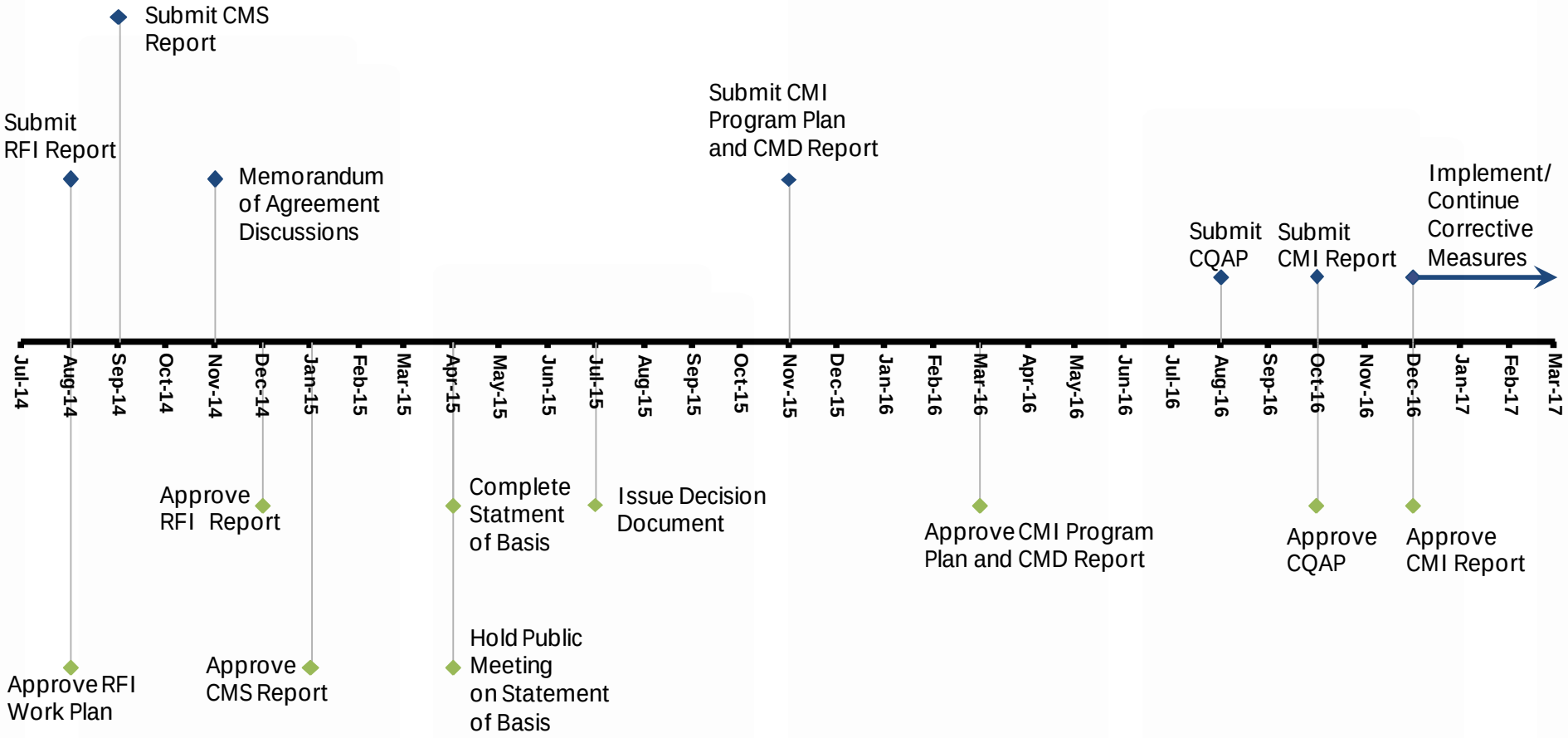
AOC-65

- ISCO Results Update
- Permanganate Candles

Adjourn

EPA ORDER DOCUMENTS

CSSA 3008(h) Order Timeline



Upcoming Order Documents

- ✓ Corrective Measures Implementation Program Plan
- ✓ Corrective Measures Design Report
- ❑ Construction Quality Assurance Plan
- ❑ Corrective Measures Implementation Report

GROUNDWATER MONITORING

Groundwater Monitoring Program
Overview

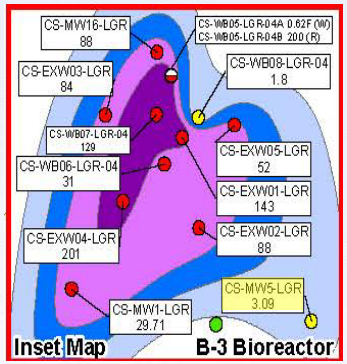
- Quarterly Monitoring Program:
  - On-post since December 1999: 63 events
  - Off-post since September 2001: 56 events
- Wells include:
  - 45 On-post monitoring wells
  - 4 On-post drinking water supply wells
  - 2 On-post former drinking water wells
  - 4 Westbay®-equipped wells
  - 5 Bioreactor Extraction Wells
  - 63 Off-post private and public supply wells
- 6 off-post wells have GAC units due to past exceedances

Groundwater Monitoring: MW5-LGR

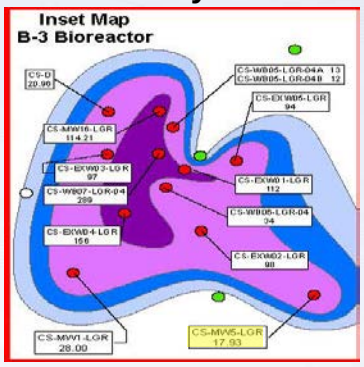
- VOCs above MCLs since December 2015 (re-sampled February 2016)
- Sampling frequency has been increased to quarterly to monitor changes/trends
- On average, groundwater levels have been up by more than 130 feet since March 2015
- Trend may suggest that the 2015 precipitation and resultant increase in Bioreactor injection quantity are related to the changes observed

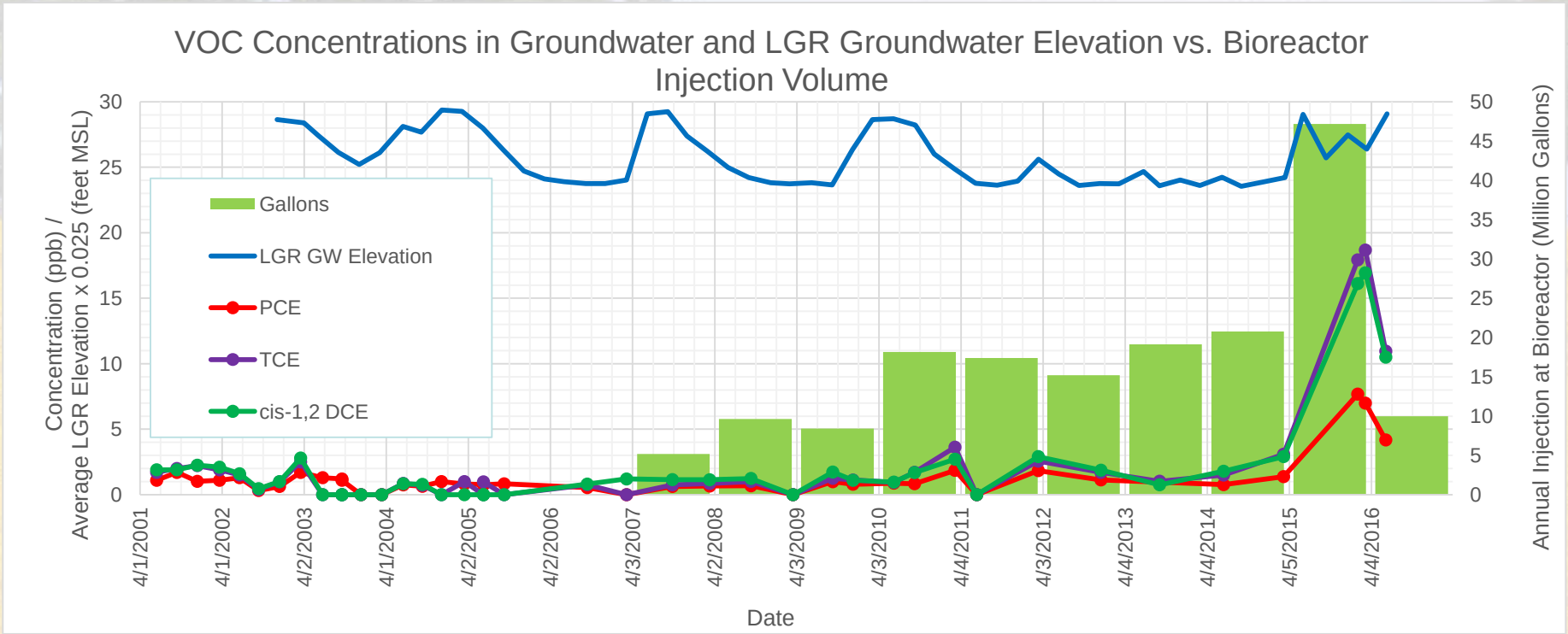
TCE

March 2015



December 2015 - February 2016

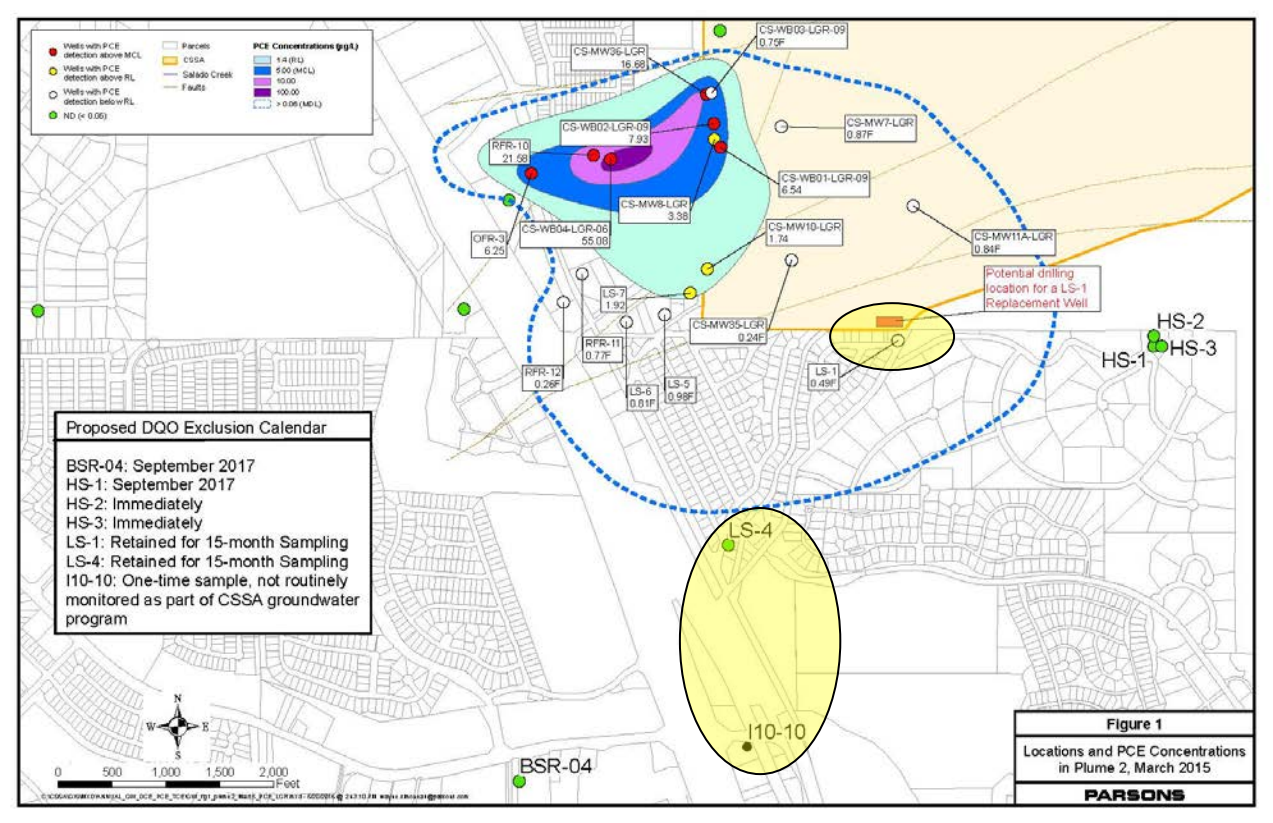




Groundwater Monitoring: LS-1 & LS-4

- SAWS owned wells LS-1 and LS-4 are scheduled to be plugged (timeframe unknown). CSSA has been sampling these wells for 15 years
- LS-1 routinely has PCE between the MDL and RL. Average concentration of 0.49 µg/L in 30 of 36 samples collected.
- LS-4 has an average PCE concentration of 0.16 µg/L in 20 of 44 samples collected.

- CSSA considers these wells important for the delineation of the Plume 2 to the south and southeast
- Seven options were considered to either retain or replace these two wells.
- Discussed with Greg Lyssy on July 8, 2016.
- Install a new LGR well on-post, adjacent to LS-1
- Sample I10-10 (Compass Bank in Leon Springs) when LS-4 no longer available



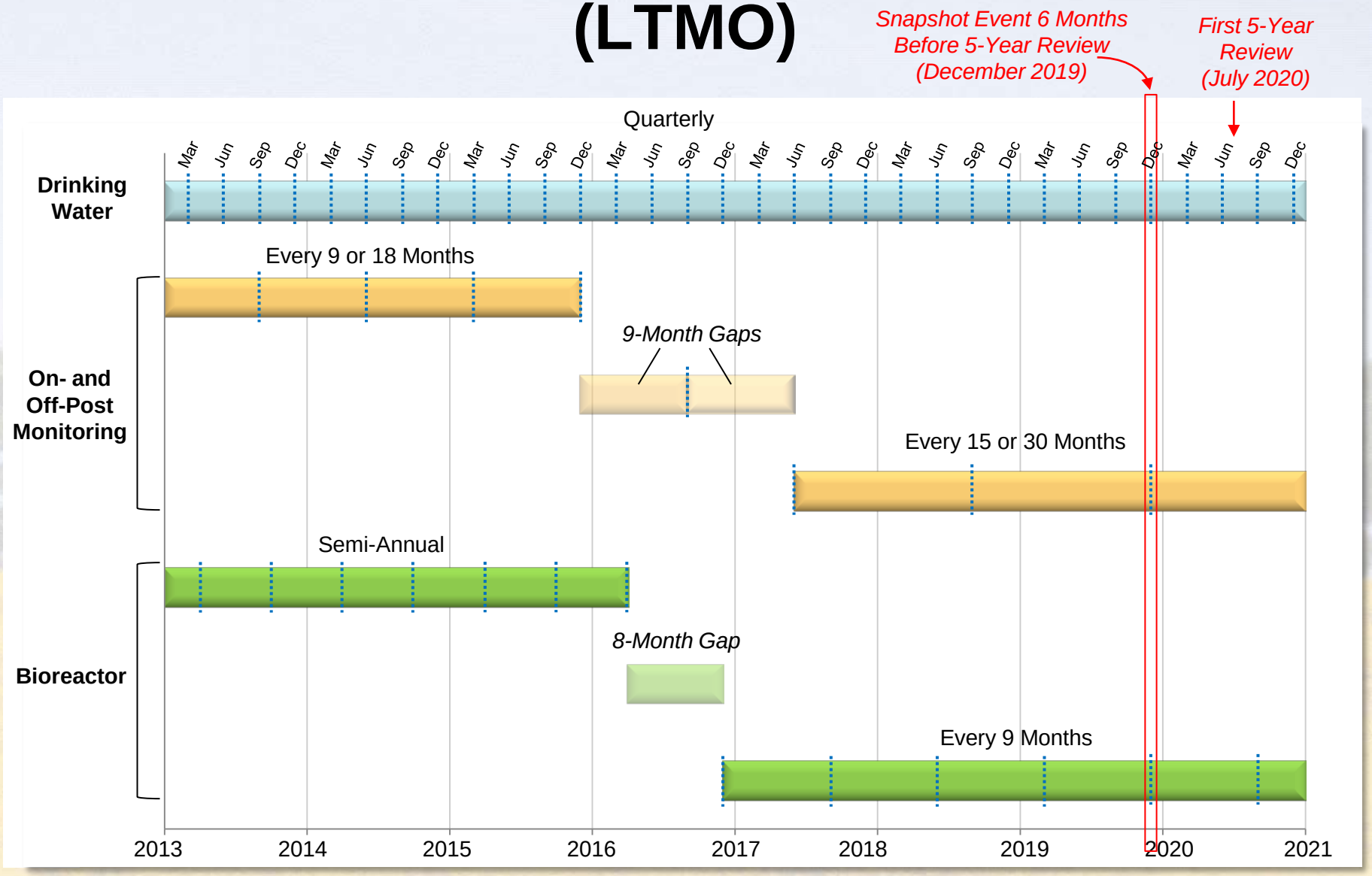
Groundwater Monitoring: 2015 LTMO

- 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

- Letters have been sent to 21 off-post wells that were scheduled for immediate exclusion by the 2015 LTMO. Thus far, no responses or objections have been received from the well owners affected.
- Continue to exclude off-post wells 1.5 miles from the boundary or after 5 consecutive 6 years of ND results.
- Transition sampling events:
  - Two more 9-month events (September 2016 and June 2017) will occur for the bulk of on- and off-post wells, with the first 15-month event occurring in September 2018
  - One 8-month event will occur at the Bioreactor in December 2016, with the first 9-month event occurring in October 2017
  - A “snapshot” event of all wells will occur in December 2019, six months before the first 5-year report due in July 2020

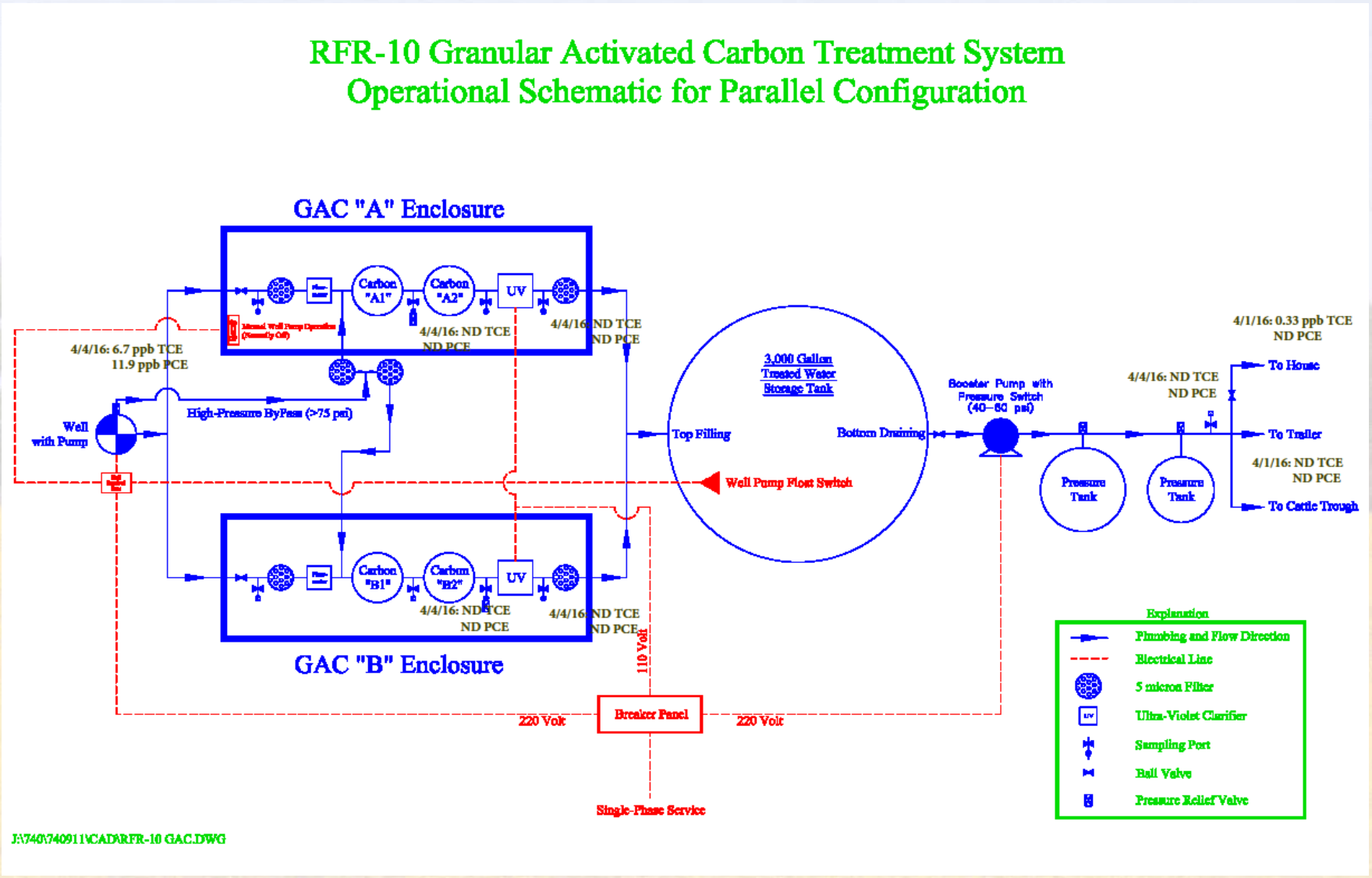
Long-Term Monitoring Optimization (LTMO)



2010 LTMO Transition 2015 LTMO

Groundwater Monitoring: RFR-10

On March 7, 2016, routine monitoring of off-post well RFR-10 indicated that one of two installed GAC treatment units were ineffective.



Groundwater Monitoring: RFR-10

- Based on this occurrence, CSSA revised its Off-Post Monitoring Response Plan to include these future actions for wells with GAC treatment units:
  - Order expedited (3-day) turnaround times from the laboratory for all scheduled or unscheduled post-GAC sample analyses so that problems in GAC treatment are identified quickly.
  - Collect post-GAC samples following each carbon vessel replacement (February and August), in addition to the normal quarterly monitoring events (March, June, September, December), to identify any problems with replacement parts.
  - Maintain an extra carbon vessel at CSSA that can be transported and installed by CSSA personnel at any well currently fitted with a GAC treatment system if the service provider is unable to make a same-day service call.

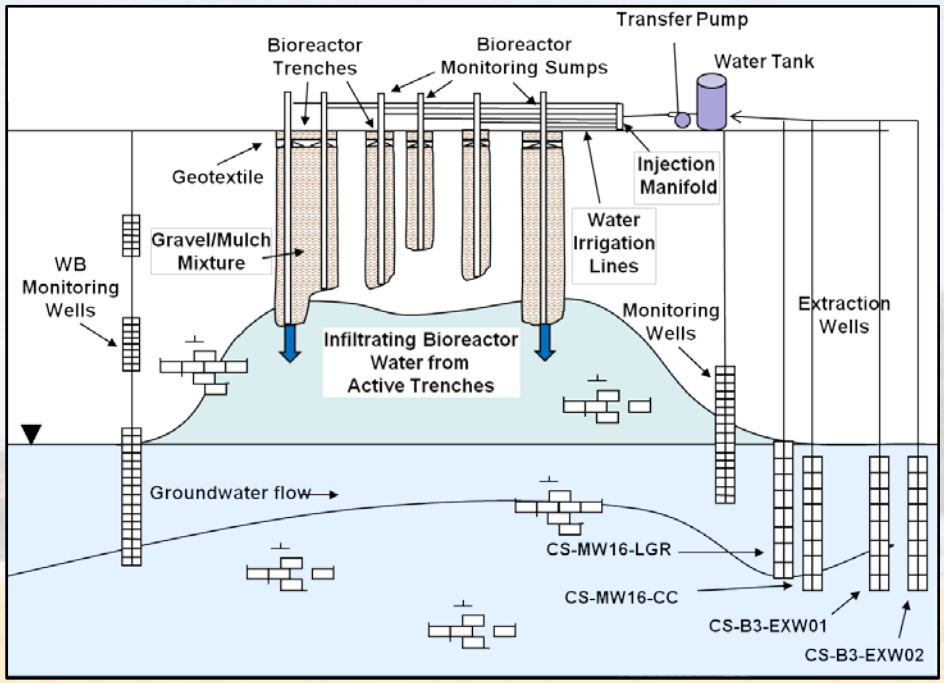
CORRECTIVE MEASURES UPDATES: SWMU B-3

Corrective Measures Objectives

1. Prevent or minimize migration of COCs in groundwater within the source area at concentrations exceeding the MCLs and restore groundwater to its most beneficial use in a reasonable timeframe.
2. Prevent human exposure to groundwater containing COCs at concentrations that exceed MCLs in water supply wells.
3. Prevent on-site worker dermal contact and/or ingestion of COCs in shallow groundwater at concentrations exceeding acceptable human health risk values.

SWMU B-3 Bioreactor Update

- VOC degradation is occurring with biological degradation end products methane, ethene, ethane, and CO_2 identified in surrounding UGR wells and LGR wells.
- Bioreactor maintains appropriate geochemical conditions (low DO, ORP, and pH) for effective anaerobic dechlorination.
- Between May 2015 and July 2016, approximately 47,182,000 gallons of groundwater were extracted and injected into Trenches 1 - 6.
- Approximately 162,250,000 gallons of extracted groundwater have been injected into the bioreactor.



Bioreactor Conceptual Diagram

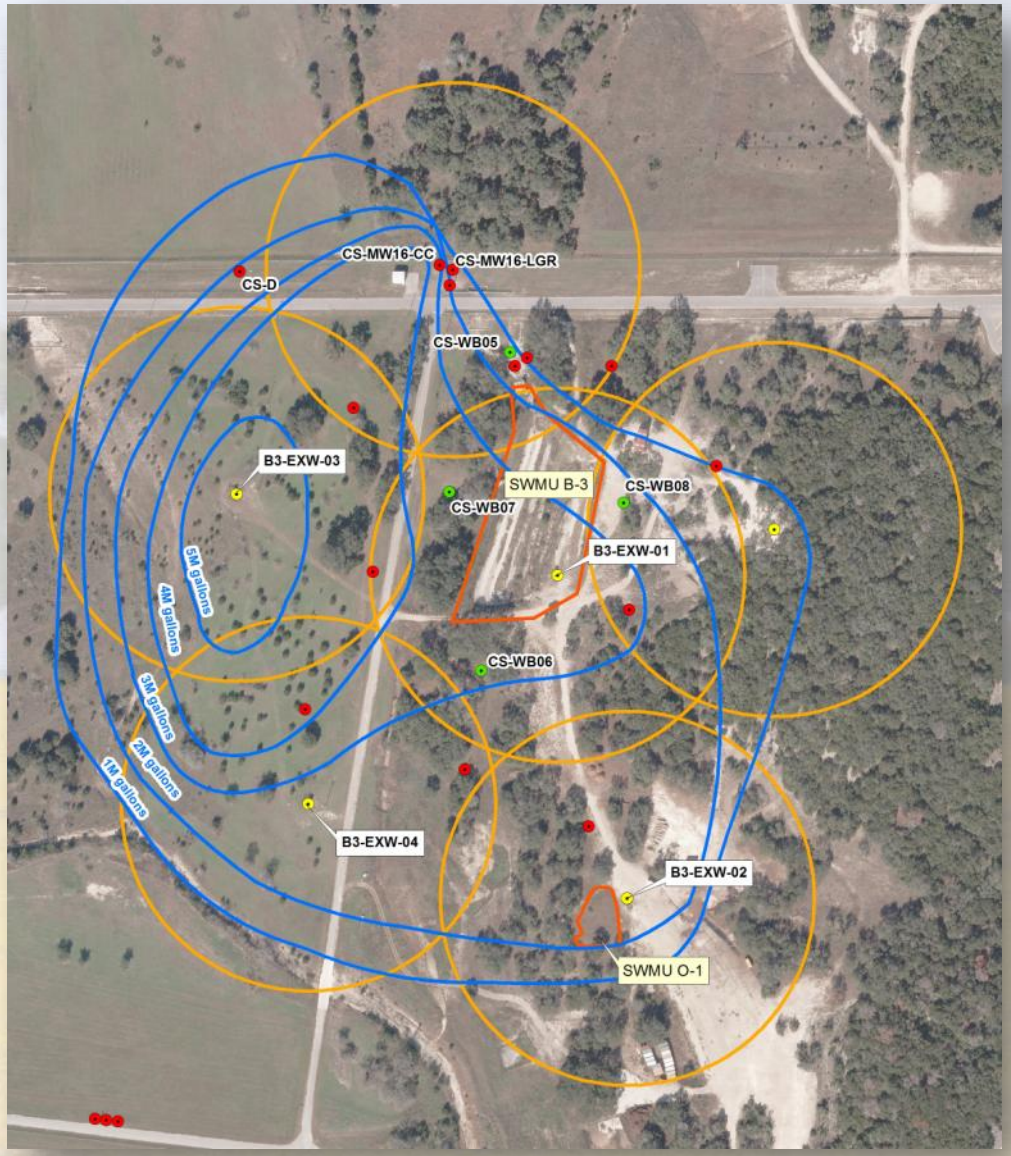
SWMU B-3 Bioreactor Update

Approximate Groundwater Contribution by Well (gallons)

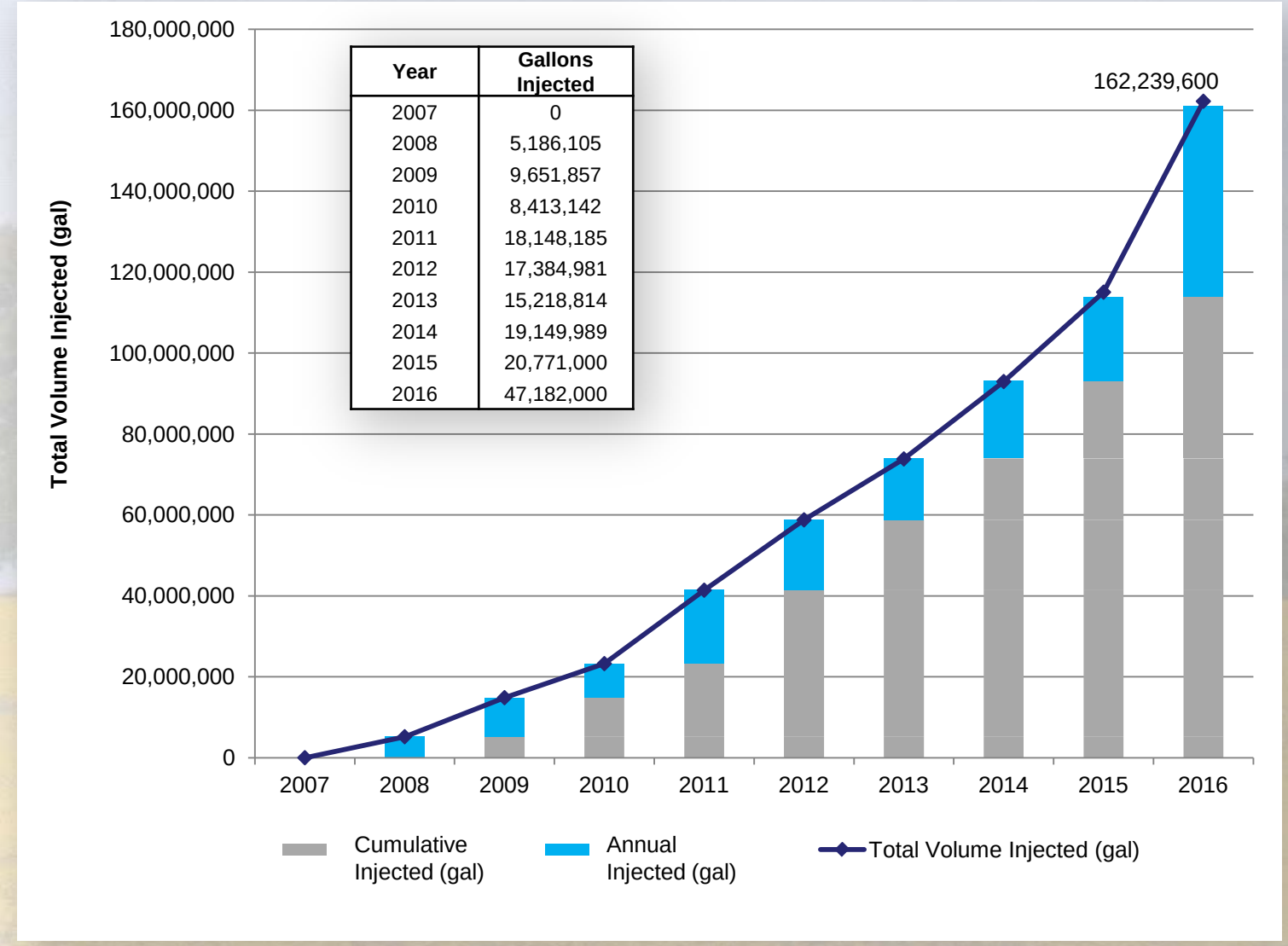
May 2015-July 2016

CS-MW16-LGR:	7,152,400
CS-MW16-CC:	5,572,200
B3-EXW01:	7,983,900
B3-EXW02:	7,245,600
B3-EXW03:	5,115,600
B3-EXW04:	7,431,800
B3-EXW05:	6,683,000

System upgrades have increased water production (> 85%) through automatic cycling of wells.



SWMU B-3 Bioreactor Update



Year	Gallons Injected
2007	0
2008	5,186,105
2009	9,651,857
2010	8,413,142
2011	18,148,185
2012	17,384,981
2013	15,218,814
2014	19,149,989
2015	20,771,000
2016	47,182,000

SWMU B-3 Bioreactor Update

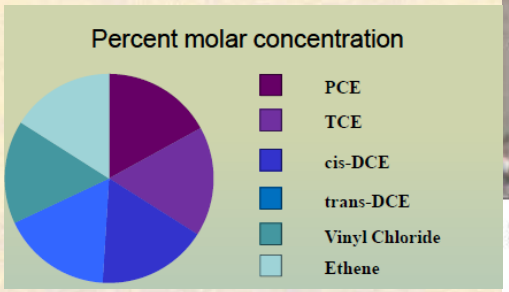
Strong evidence of dechlorination within the bioreactor

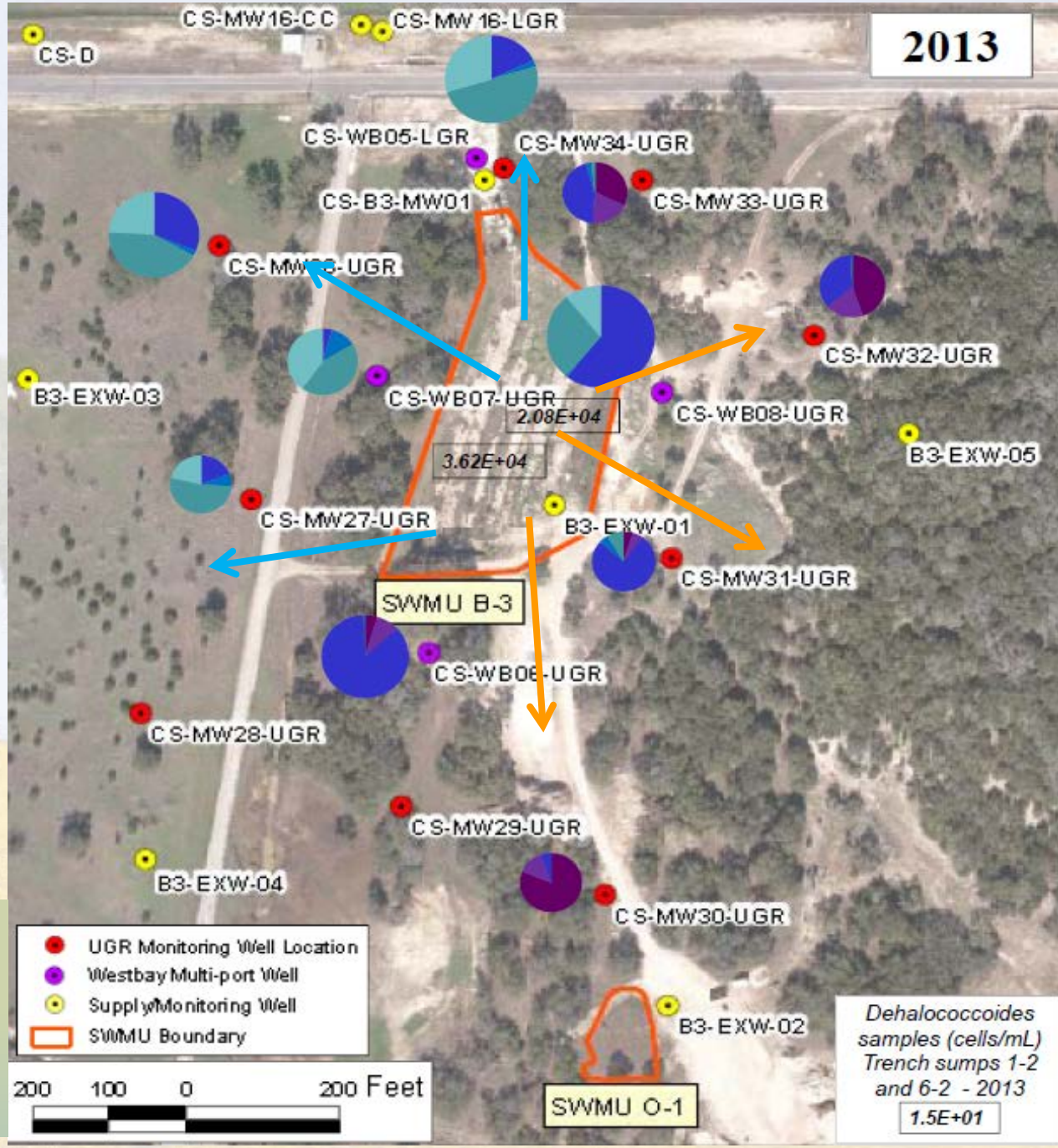
- -absence of PCE/TCE
- -presence of intermediates
- -presence of ethene
- -geochemistry
- -microbial population

Bioreactor effects in the UGR are migrating to the north and west but less pronounced to the south and east.

Bioreactor effects in the LGR are migrating to the north towards CS-MW16

*Data from the 2014 bioreactor report





SWMU B-3 Bioreactor

Identified Conditions to Improve

- Organic carbon loading in the bioreactor is only sufficient to maintain iron/sulfate reducing conditions. Methanogenic conditions are generally not achieved.
- In times of heavy rain, conditions in the reactor become more aerobic. Anaerobic conditions are preferable.

  Consider adding substrate to trenches through injection of Emulsified Vegetable Oil (EVO) and lactate.
- Organic carbon is not being distributed within the UGR or the LGR away from the bioreactor sufficiently

  Add additional injection wells to directly affect UGR and LGR conditions, particular to the south and east.

SWMU B-3 Bioreactor

Next Steps

Inject additional substrate (EVO/Lactate) in the bioreactor to boost carbon loading

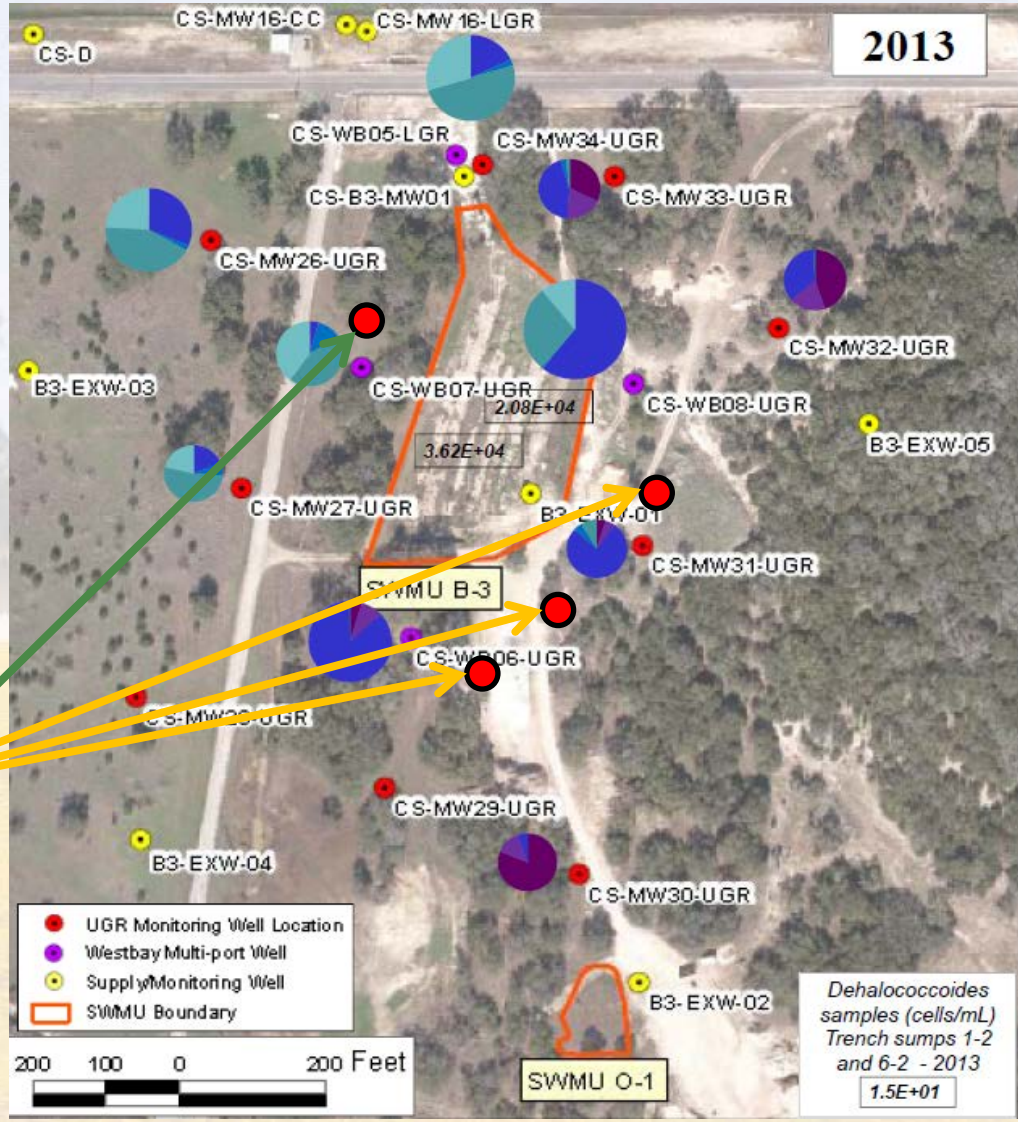
- Consistently achieve methanogenic conditions
- Manage increased water from extraction wells

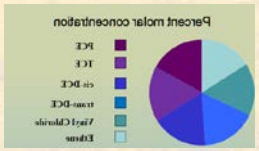
Consider addition of ferrous sulfate in the bioreactor and/or new injection wells

- Stimulate biogeochemical transformation process

Consider installing injection wells along the south and southeast sides for the UGR/LGR

- Inject EVO/Lactate using water from extraction wells
- Bioaugment using water from bioreactor





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 monitoring.
- Continue UIC monitoring with annual reporting in July 2016.
- Continue SCADA control and automation integration.

Maintenance and sump monitoring upgrades allowing continuous reading/recording of bioreactor trench water levels through SCADA.

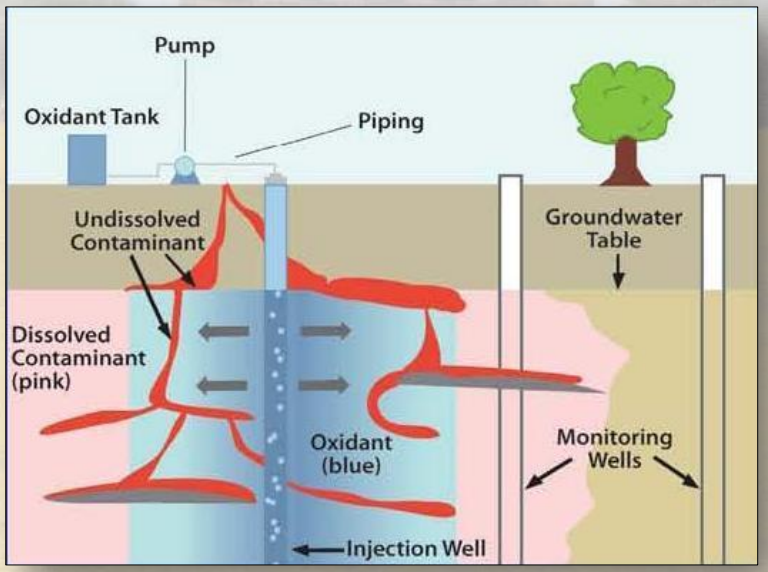
SWMU B-3 Bioreactor
Solar Panels: Status

- Installation of solar panels and command unit complete.
- Connection to well EX02 is completed, but requires testing to ensure electrical feeds are correct.
- Testing to evaluation operation and effectiveness given the challenges:
  - Produces single phase, need three phase power
  - Battery overcharging produces hydrogen gas
  - Lightning strike created power surge.

CORRECTIVE MEASURES UPDATES: AOC-65

AOC-65 Source Area Treatment

- Important to maximize contact time of injected oxidants with subsurface contaminated zones
- Phased approach initiated in 2012
- Variables that factor into effectiveness at AOC-65:
  - Volume of ISCO solution injected
  - Location of injection and transmissivity (faults and fractures) to source
  - Persistence of solution
  - Depth to groundwater at time of injection



ISCO Objectives

Phase I: Test viability of ISCO, specifically with the application of persulfate in trench galleries and SIW-01

Phase II: Increase injection volume and test IIW applicability

Phase III: Large volume to affect greater area via application to trench, IIWs, and SIW-01.

Phase IV: Test effectiveness of permanganate which has longer life and lower effective concentration. Assess new exterior and interior cells to target more specific areas.

ISCO Injections

Oxidant	Injection Phase (date)	Volume and Type	Injection Location
Persulfate Solution	Phase I (2012)	~15,000 gallons 20% sodium persulfate	Infiltration trench and SIW-01
	Phase II (2013)	~34,000 gallons 20% sodium persulfate	Infiltration trench, SIW-01, IIWs
	Phase III (2014)	~106,000 gallons 20% sodium persulfate	Infiltration trench, SIW-01, IIWs
Permanganate Solution	Phase IVa and IVb (2015)	~3,500 gallons 0.45% and ~7,000 gallons 0.9% sodium permanganate	Newly constructed infiltration cells (3 exterior, 2 vault)

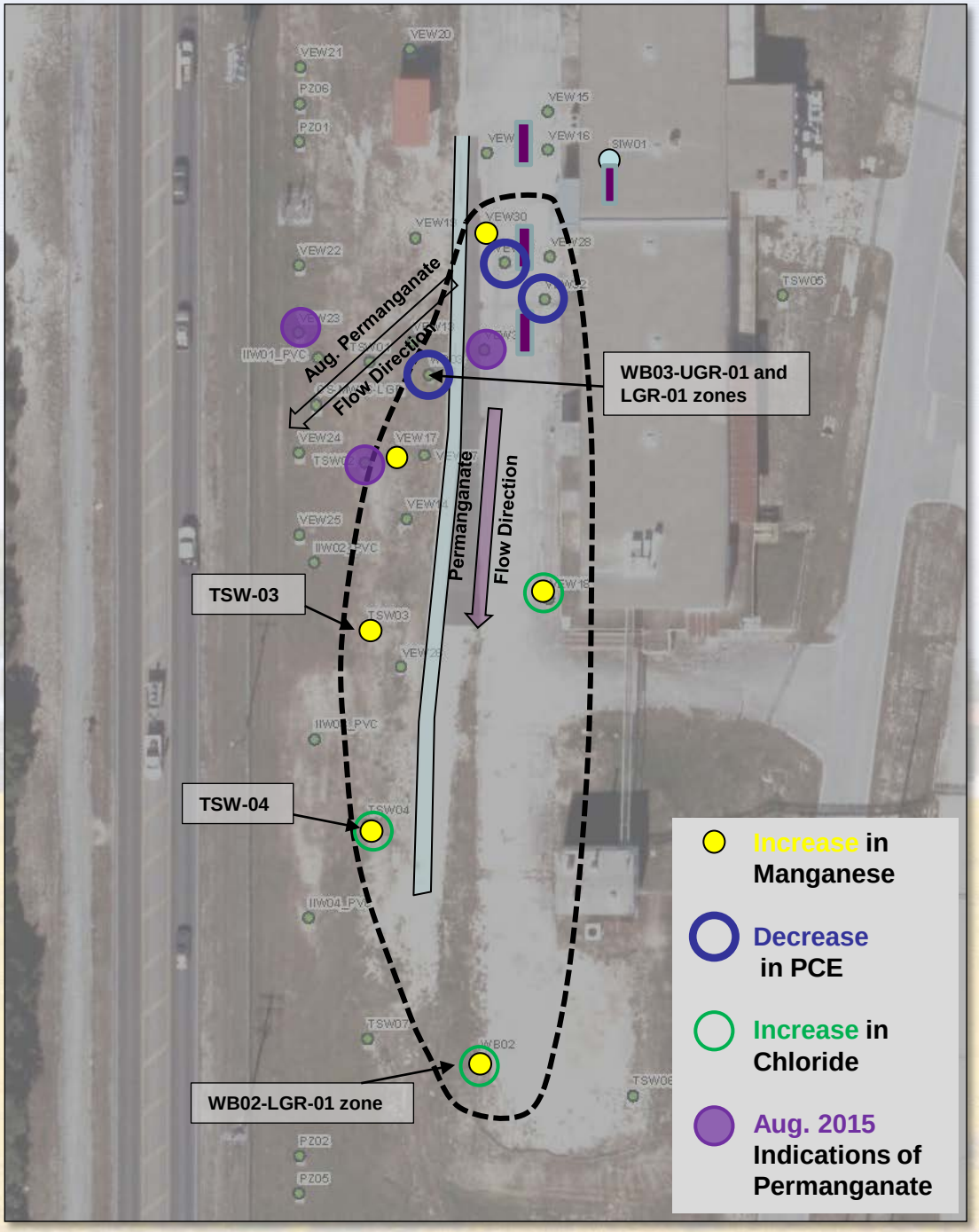
ISCO Path Forward - Questions

- Does ISCO via permanganate work?
- Is permanganate more/less effective than persulfate?
- Are PCE concentrations being reduced? In absence of metals mobilization?
- Do we see a rebound of PCE concentrations?
- Are we affecting concentrations farther from the injection locations?
- If low-concentration permanganate injections are effective, look into passive-slow progression injection or permanganate wax application?
- What are the effects of changing groundwater levels? How will higher groundwater levels affect the flow of injected (or passively applied) ISCO?

ISCO Permanganate Injections (Phase IV)

3,500 gallons (0.45%) in August 2015

7,000 gallons (0.9%) in November 2015

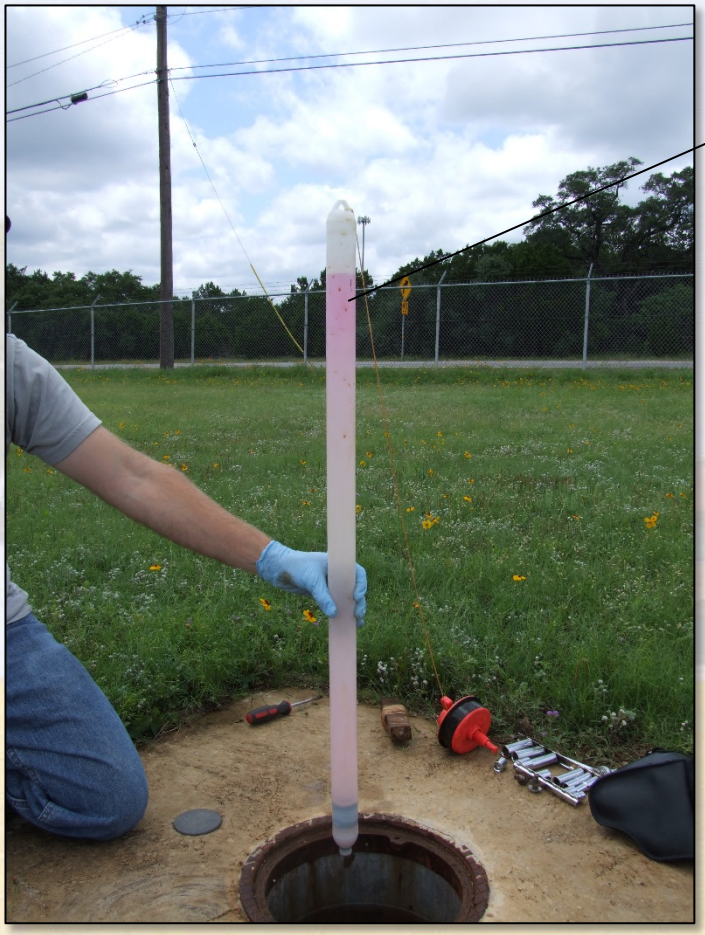


Permanganate Injection Observations

- Increase in manganese is anticipated following permanganate consumption/ destruction of VOCs
- Increases in chloride indicates products of VOC destruction
- Reductions in PCE are generally in the area of increased manganese and upgradient of areas where increased chloride is observed
- Initially (following August 2015 injection), permanganate was visually identified in more westerly wells
- Recently (June 2016), permanganate was identified in more southern areas (TSW-04 and TSW-03).

ISCO Observations

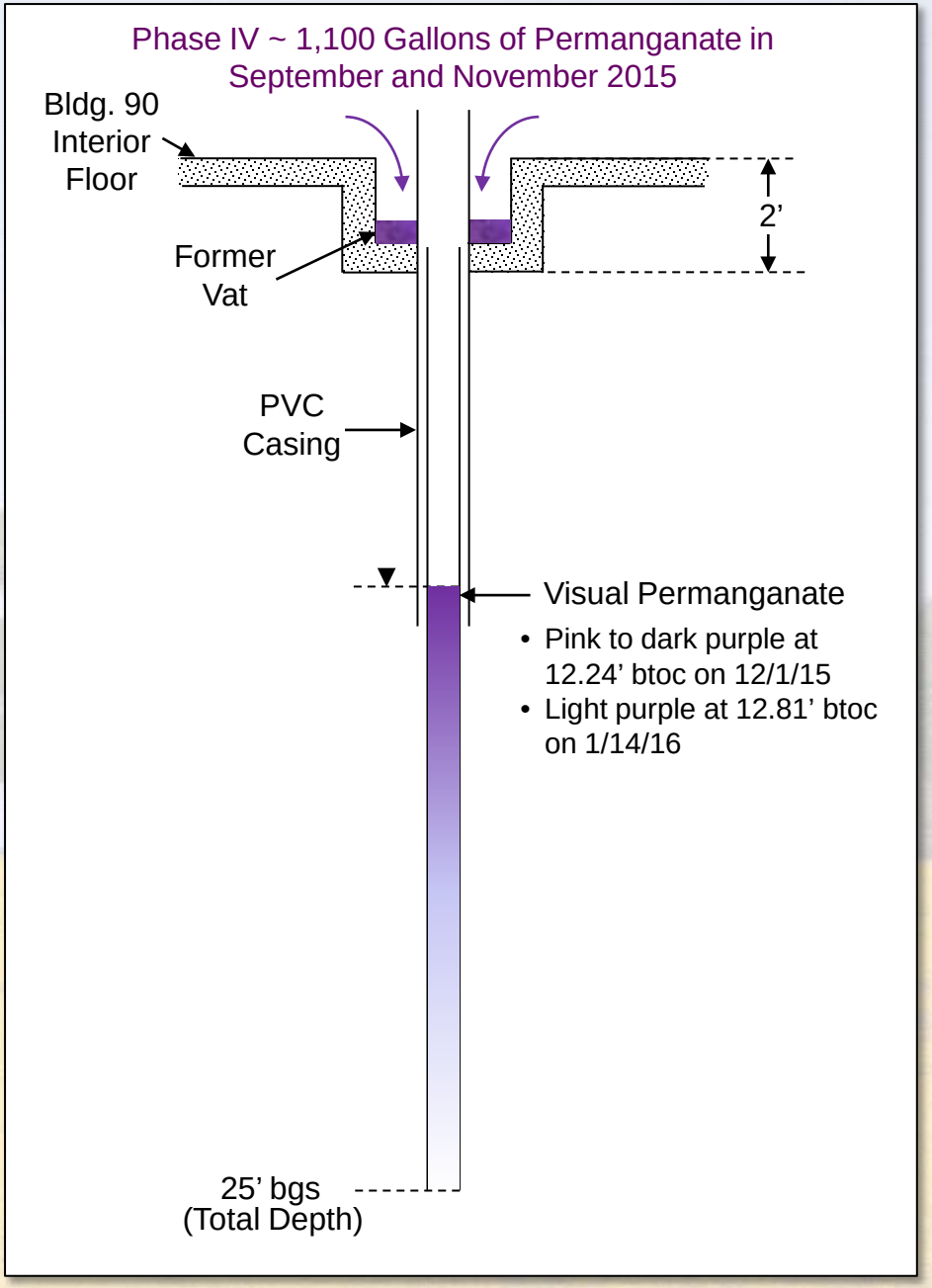
- Injected solution is not uniformly distributed within some wells
- Well TSW-03 shown here, similar trends observed at SIW-01 and TSW-04
- Persistence of permanganate oxidant is greater than the persulfate oxidant. TSW-03 contained permanganate solution 6 months after injection
- Mobility of the permanganate oxidant appears to be sufficient as TSW-03 and TSW-04 are 140 feet to 250 feet from the injection cells.



ISCO Observations

Interior Infiltration Cells and SIW-01

- Injected permanganate into infiltration cells located in former vat area.
- Later observed stratified permanganate solution in SIW-01.
- PCE concentrations were increasing in SIW-01 for three monitoring events following injection, but are currently decreasing.
- As observed from exterior well monitoring, permanganate appears to be mobilized to the south and west.



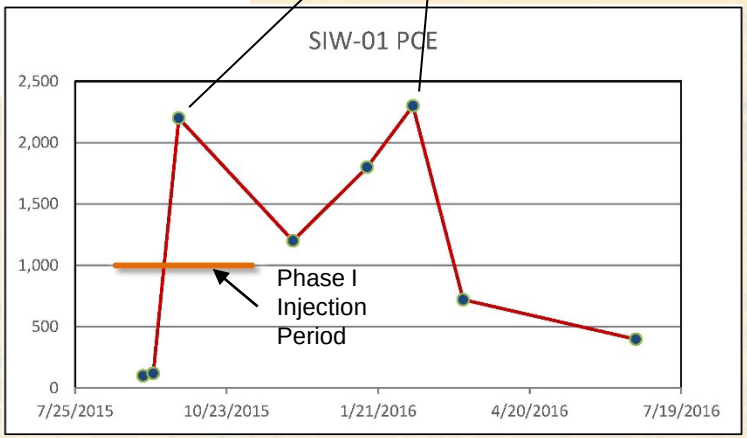
VOC Concentrations at Permanganate Injection Locations

Well/Cell ID	Sample Date	1,1-Dichloro-ethene µg/L	cis-1,2-Dichloroethene µg/L	Tetrachloro-ethene (PCE) µg/L	Trichloroethene (TCE) µg/L	trans-1,2-Dichloroethene µg/L	Vinyl chloride µg/L
Middle-IC	8/25/2015	0.12	**7.6**	**1,400**	**11**	0.080	0.080
	9/9/2015	0.24	0.14	0.12	0.10	0.16	0.16
	9/24/2015	0.24	0.14	0.12	0.10	0.16	0.16
	12/1/2015	0.12	0.070	**1.4**	0.050	0.080	0.080
	1/14/2016	0.24	0.14	**1.8**	0.10	0.16	0.16
	2/10/2016	0.24	0.14	0.12	0.10	0.16	0.16
	3/11/2016	0.12	0.070	0.060	0.050	0.080	0.080
	6/22/2016	0.12	0.07	**0.88**	0.05	0.08	0.08
South-IC	8/25/2015	0.12	0.070	**1,900**	**1.1**	0.080	0.080
	9/9/2015	0.24	0.14	0.12	0.10	0.16	0.16
	9/24/2015	0.24	0.14	0.12	0.10	0.16	0.16
	12/1/2015	0.12	0.070	0.060	0.050	0.080	0.080
	1/14/2016	0.24	0.14	**0.97**	0.10	0.16	0.16
	2/10/2016	0.24	0.14	0.12	0.10	0.16	0.16
	3/11/2016	0.12	0.070	0.060	0.050	0.080	0.080
	6/22/2016	0.12	0.07	0.06	0.05	0.08	0.08
SIW-01	9/3/2015	0.12	0.070	**100**	0.050	0.080	0.080
	9/9/2015	0.12	0.070	**120**	0.050	0.080	0.080
	9/24/2015	0.12	**3.5**	**2,200**	**10**	0.080	0.080
	12/1/2015	0.12	0.070	**1,200**	**1.0**	0.080	0.080
	1/14/2016	0.12	0.070	**1,800**	**1.1**	0.080	0.080
	2/10/2016	0.24	**36**	**2,300**	**44**	**0.31**	0.16
	3/11/2016	6.0	**22**	**720**	**13**	4.0	4.0
	6/22/2016	0.12	**5.4**	**398**	**5.8**	0.080	0.080

Detections are bolded. Results not highlighted are detections above the RL.
Not detected. Reported result is reported as the MDL and flagged U.
Trace value. Reported result is a value between the MDL and the RL and is flagged F.

Injection cells indicate trace or ND following injections.

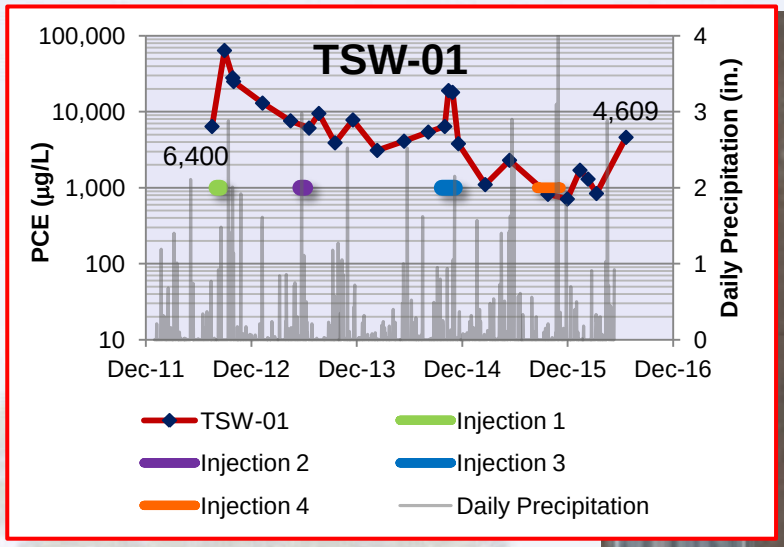
Increase in PCE following interior cell injections at SIW-01

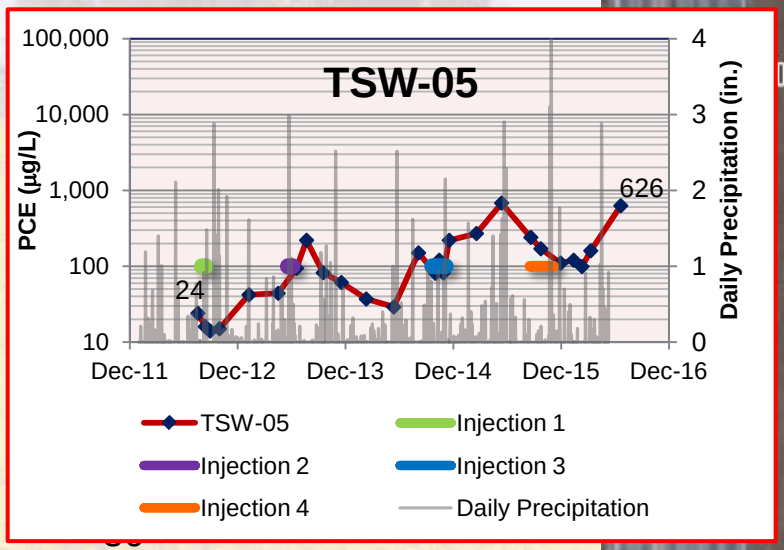


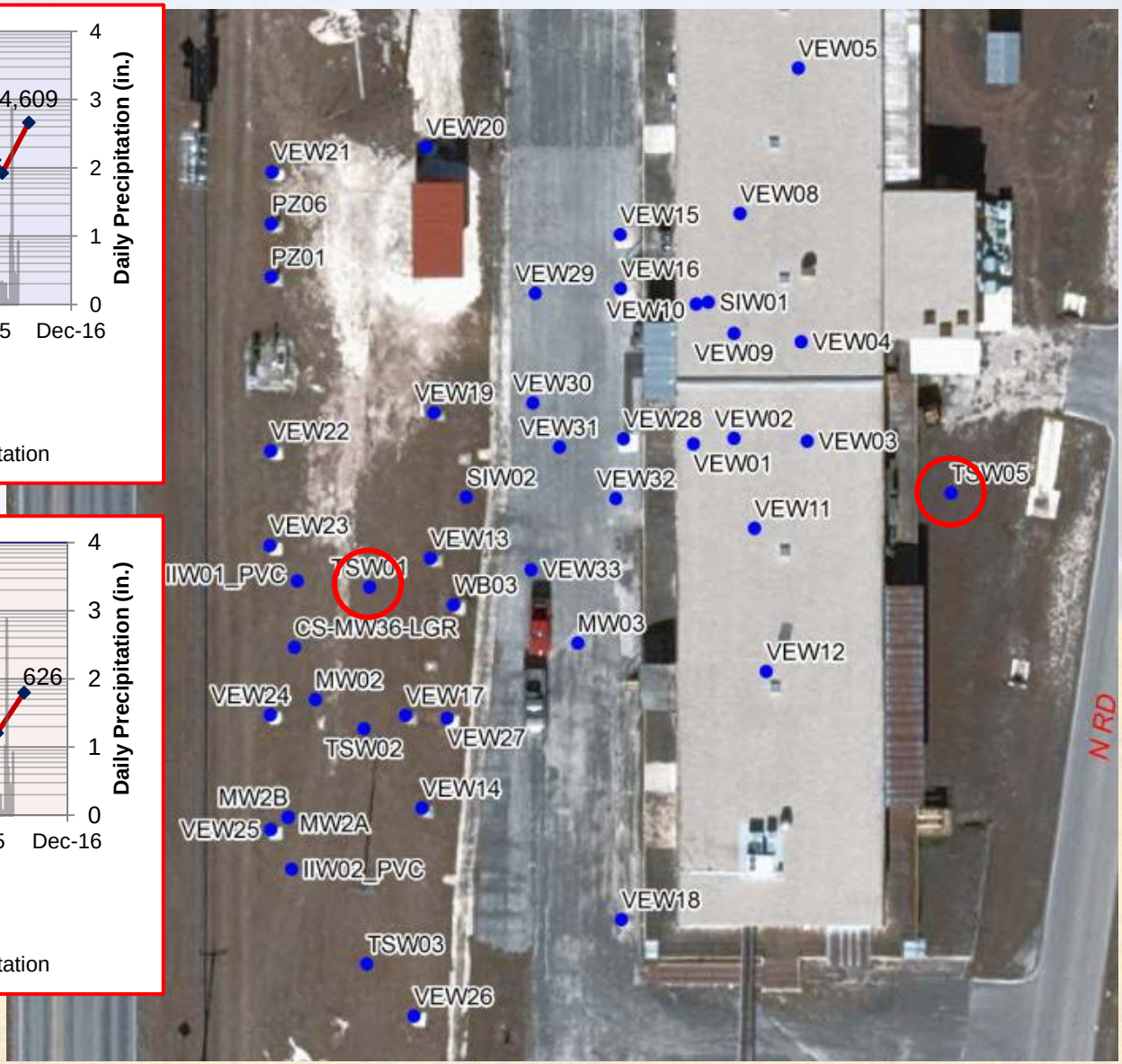
* Northern Infiltration Cell and Interior Building
90 Cells were dry following injections

SIW-01 is open-borehole from 10 to 25 ft bgs, and the two interior infiltration cells are 2 feet deep each.

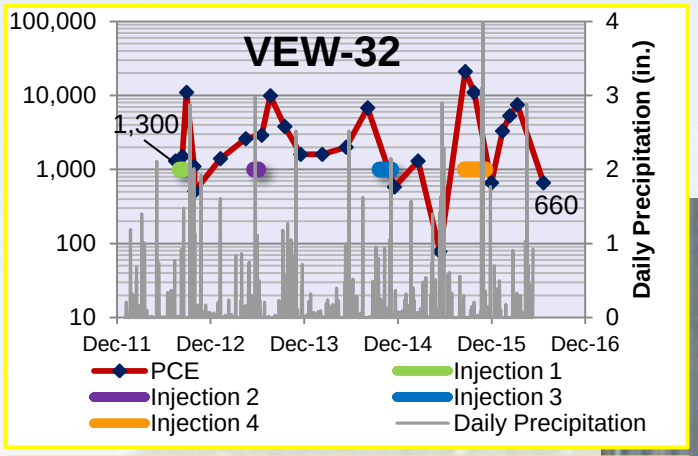
PCE Concentrations at TSW-01 and TSW-05

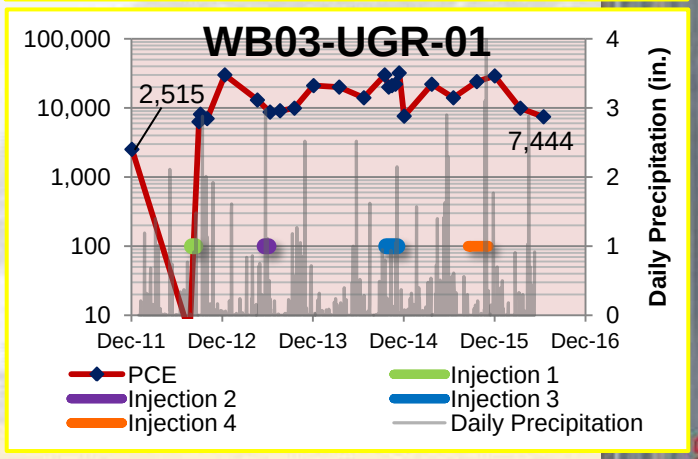


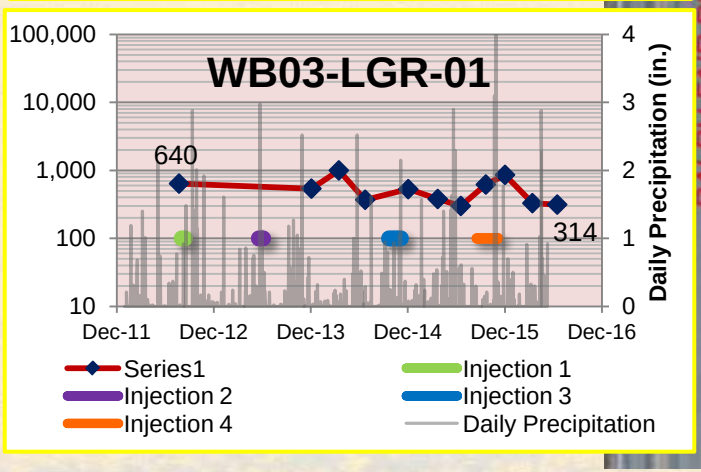


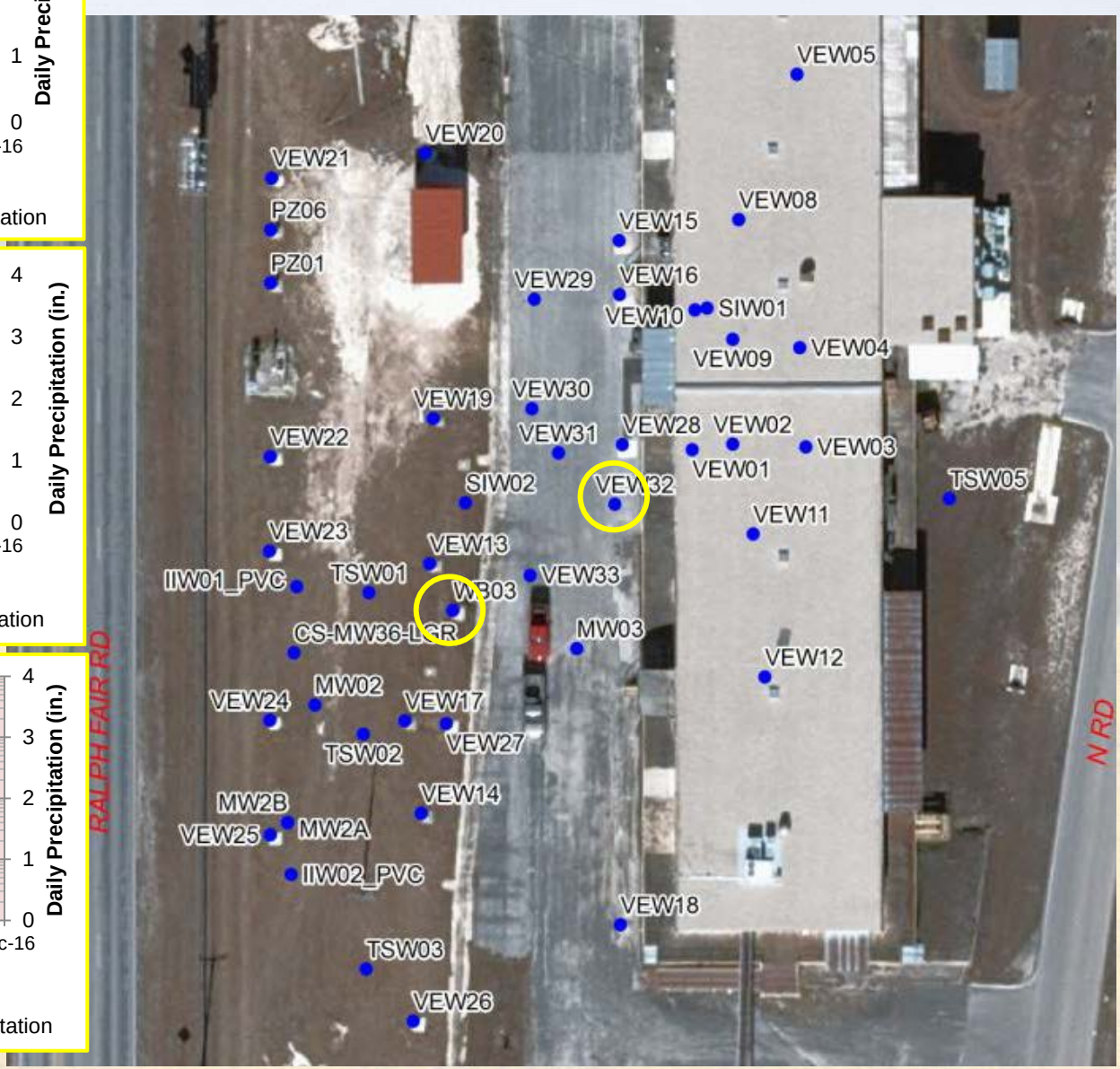


PCE Concentrations at VEW-32 and WB03









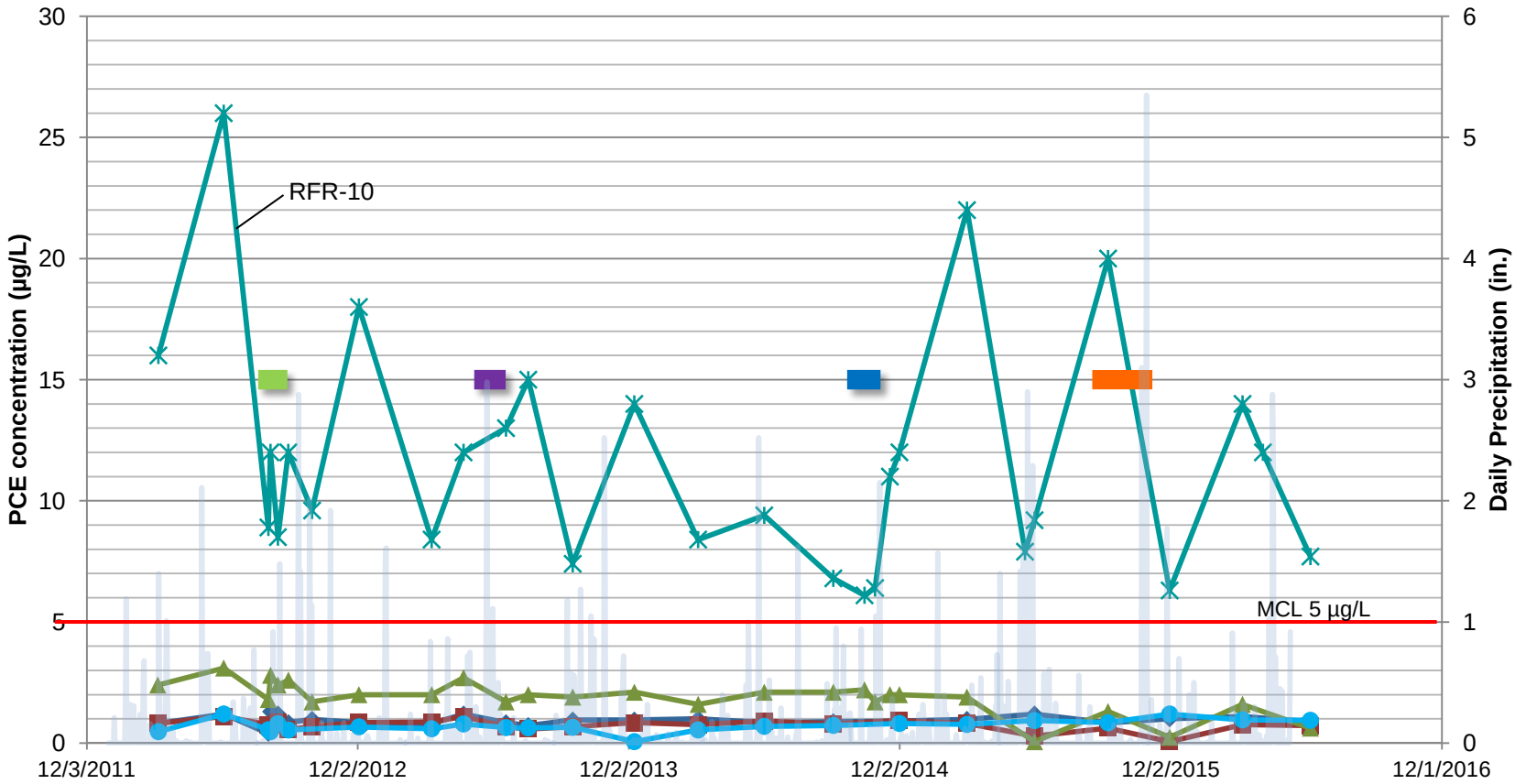
ISCO Observations

PCE Concentrations Following Phase IV Injections

- With persulfate we were unable to influence WB zones, permanganate clearly did reach these zones
- PCE actually increased in VEW-32 during persulfate applications
- Increases in TSW PCE concentrations may be pneumatic
- No metals mobilization issues to private wells

ISCO Observations

Off-Post Drinking Water Well Monitoring



AOC-65 ISCO
Identified Conditions to Improve

- In times of heavy rain or saturated conditions, groundwater appears to flow in differing directions than during normal drier conditions. Provide a continuous oxidant source delivery to groundwater to affect contaminants during differing groundwater flow conditions.

Consider alternative injection method(s) of permanganate oxidant to the underlying vadose zone formation.

ISCO Path Forward - Questions

- Does ISCO via permanganate work?
  - Yes, as observed through infiltration cell concentrations.
- Is permanganate more/less effective than persulfate?
  - Both are effective. Permanganate is lasting longer than persulfate (increased contact time).
- Are PCE concentrations being reduced? In absence of metals mobilization?
  - Mixed results to date. No metals mobilization.
- Do we see a rebound of PCE concentrations?
  - Difficult to distinguish between concentration changes caused by fluctuating water levels, precipitation, desorption from the formation, and ISCO.
- Are we affecting concentrations farther from the injection locations?
  - Possibly, permanganate has been identified (visually) in a number of wells.
- If low-concentration permanganate injections are effective, look into passive-slow progression injection or permanganate wax application?
  - Slow release ISCO injections allow for continuous, long-term application, thereby treating contaminated groundwater under all hydrologic conditions encountered (during low and high water levels and during intense or light precipitation events).
- What are the effects of changing groundwater levels? How will higher groundwater levels affect the flow of injected (or passively applied) ISCO?
  - Water level effects can be monitored during sustained slow release ISCO.

ISCO Next Steps
Sustained-Release ISCO

Currently two options for slow-/extended-release ISCO:

- PeroxyChem slow release potassium persulfate
- Carus Corporation RemOx SR permanganate

While the slow release potassium persulfate is an option, it is in the developmental stage and few details are available. Additionally, persulfate longevity would be an issue, primarily due to the much smaller quantities of oxidant involved (as compared to 66 tons) and radius of influence.

ISCO Next Steps
Sustained-Release ISCO

Chosen technology: RemOx SR potassium permanganate crystals infused within a paraffin wax matrix

- 2.5” diameter,18” long cylinders will fit in any 4” diameter well (VEW, TSW, SIW)
- Diffuses permanganate into groundwater within the well
- Relies on natural groundwater flow to carry oxidant away from well
- Low GW elevations (low flow): concentrations high, smaller radius of influence (ROI)
- High GW elevations (high flow): concentrations lower, larger ROI

ISCO Next Steps
RemOx SR Permanganate Candles

Factors effecting longevity:

- Rate of VOC treatment and Natural Oxidant Demand (NOD) is relatively low at the site
- Hydraulic Conductivity
- Hydraulic Gradient
- Porosity

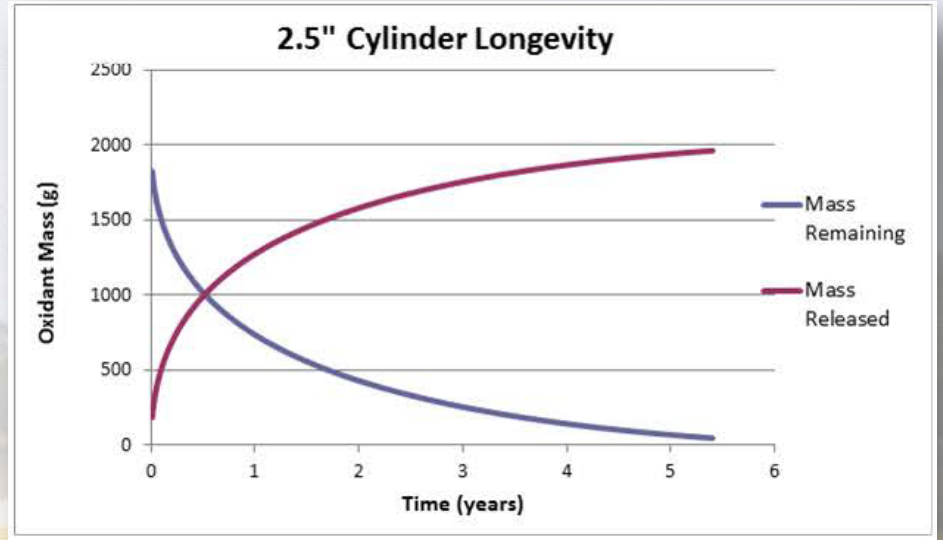


Figure 3. 2.5" (6.35 cm) Cylinder Longevity Prediction

ISCO Next Steps
RemOx SR Permanganate Candles

Potential relevance of sustained release ISCO oxidant

- Allows for low impact treatment at a selection of wells.
- Likely candidates include: TSW-01, VEW-13, VEW-19, VEW-20 (upgradient), VEW-29, VEW-15 or -16. Others?
- Application of slow release oxidant allows for continual treatment throughout differing hydraulic conditions and monitoring of surrounding wells.