



DEPARTMENT OF THE ARMY  
CAMP STANLEY STORAGE ACTIVITY, MCAPP  
25800 RALPH FAIR ROAD, BOERNE, TX 78015-4800

June 21, 2017

U-042-10

SUBJECT: Annual Status Report (June 2016 to May 2017) of the AOC-65 Class V Remediation Infiltration Galleries and Injection Wells at Camp Stanley Storage Activity, Boerne, Texas, TCEQ Authorization No. 5X2600645; IHWCA#69026; CN602728206/RN100662840

Texas Commission on Environmental Quality  
Attn: UIC Permits Team, MC233  
Radioactive Materials Division  
PO Box 13087  
Austin, Texas 78711-3087  
512/239-3150

UIC Permits Team:

The Camp Stanley Storage Activity (CSSA), McAlester Army Ammunition Plant, U.S. Army Field Support Command, Army Materiel Command, U.S. Army, is submitting this semiannual report summarizing the injection activities performed at the on-post Area of Concern (AOC) 65 site. The injection activities performed are part of the AOC-65 In-Situ Chemical Oxidation (ISCO) remedial applications for treatment of chlorinated compounds in groundwater.

This annual letter provides a summary of activities for the months of June 2016 through May 2017 and includes a report of injection and associated ISCO activities conducted at AOC-65 during the past year as specified by the Texas Commission on Environmental Quality (TCEQ) Underground Injection Control (UIC) permit. The remediation activities performed during this period include the installation of 12 oxidant-infused paraffin wax cylinders in six injection wells located within AOC-65 and subsequent monitoring.

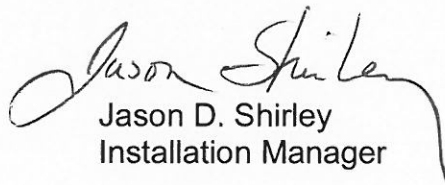
Injection activities associated with the Class V Injection Well Authorization No. 5X2600645 (amended June 22, 2016) during this reporting period have included oxidant application activities and groundwater monitoring. Groundwater samples were collected from existing monitoring wells, injection wells and infiltration galleries for VOCs, metals, anions (chloride and sulfate) analysis to track the progress of current ISCO applications. Additionally, water quality parameters (pH, DO, ORP, and conductivity) were also collected at injection and monitoring wells. Sampling events were conducted in June, September, and December 2016, and March 2017. Monitoring events will continue quarterly, with the next monitoring event scheduled to take place in June 2017.

ISCO chemicals were applied during this reporting period following groundwater monitoring efforts performed in December 2016. Twelve oxidant-infused wax cylinders were installed in six injection wells (two per well) around the site. These wells include: VEW-19, VEW-27, VEW-32, SIW-01, TSW-01, and TSW-05. The cylinders consist of potassium permanganate, sodium persulfate, and paraffin wax in a ratio of 38:38:24. The cylinders are 18 inches long and either 2 inches or 1.35 inches in diameter. The 2-inch diameter cylinders each weigh 5.75 lbs and the 1.35-inch diameter cylinders each weigh 2.875 lbs. The 2-inch diameter cylinders were installed in wells VEW-19, VEW-32, and TSW-01 and 1.35-inch diameter cylinders were installed in wells VEW-27, SIW-01, and TSW-05. The cylinders were installed at the base of the screened interval in each well to maximize contact with groundwater and provide a persistent source of oxidant. This passive approach to oxidant application allows for a sustained release of ISCO chemicals into groundwater under varying hydrologic conditions encountered throughout the year. Oxidant concentrations will vary over time as a function of groundwater flow through each well, water level, and exposed cylinder surface area. **Table 1** provides oxidant concentrations in groundwater collected from the injection wells eight weeks after installation.

No additional injections are anticipated during the next twelve months, however, a possible scenario for additional ISCO applications may include the replacement of spent cylinders in wells that currently include cylinders or the installation of additional cylinders at other existing/permitted wells. No new injection wells or infiltration cells are planned at this time.

If you have any questions regarding the specific ISCO application activities at CSSA, please feel free to contact me at 210-295-7416 or Ken Rice, Parsons at 512-719-6050, [ken.r.rice@parsons.com](mailto:ken.r.rice@parsons.com).

Sincerely,

  
Jason D. Shirley  
Installation Manager

Enclosures

cc: Felicia Kraintz, CSSA Environmental Manager  
Greg Lyssy, USEPA Region 6  
Julie Burdey, Parsons – Austin  
Ken Rice, Parsons – Austin  
File: 640149.110046.03000

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**Table 1**  
**Analytical Summary Data**

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**Table 1**  
**Permanganate Concentrations within**  
**Injection Wells at AOC-65**

Well ID	concentration	unit
SIW-01	468	mg/L
TSW-01	32.5	mg/L
TSW-05	22.44	mg/L
VEW-19	52.1	mg/L
VEW-27	49.2	mg/L
VEW-32	22.4	mg/L

Samples collected 01/25/2017 and analyzed using method M4500

**Field Forms**

ISCO Sampling AOC-65

Personnel: Elliott & Dieter

Permit required samples shaded gray.  
 Bold = Performance Monitoring Samples

Well ID	TD / pump depth	Water Level ('BTOC)	Sample Date	Sample Time	Temp. (°C)	Cond. (ms/cm <sup>2</sup> )	DO	pH	ORP
LS-5	NA								
LS-6	NA								
LS-7	NA								
OFR-3	NA								
RFR-10	NA								
RFR-11	NA								
CS-MW36-LGR	361.5								
CS-MW8-LGR	302								
CS-MW7-LGR	293								
CS-MW6-LGR	314								
AOC65-VEW13-LGR	41	33.24	6/21/16		22.88	0.619	0.37	6.82	82.4
AOC65-VEW14-LGR	61	59.37	6/21/16		22.70	0.703	2.80	6.80	59.2
AOC65-VEW15-UGR	13	7.26	6/21/16	1055	23.13	1.021	0.07	7.07	306.2
AOC65-VEW16-LGR	41	29.43	6/21/16		22.86	0.583	0.05	6.93	37.5
AOC65-VEW17-LGR	52.5	51.11	6/21/16		22.89	0.784	1.38	6.70	-16.9
AOC65-VEW18-LGR	56	32.67	6/22/16	0825	22.87	10.39	1.55	7.00	233.0
AOC65-VEW19-UGR	26	10.30	6/21/16	0840	22.39	17.29	30.40	8.96	10.0
AOC65-VEW20	25.7	10.43	6/21/16		21.85	0.649	0.79	6.92	238.1
AOC65-VEW21	27	13.66	6/20/16		21.88	0.673	4.01	6.78	285.9
AOC65-VEW22	50.5	47.85	6/20/16		22.68	0.535	7.92	6.80	241.5
AOC65-VEW23	21	11.53	6/20/16		21.81	3.1024	0.28	6.31	121.7
AOC65-VEW24	50	49.81							
AOC65-VEW25	21.5	16.75	6/21/16	0935	22.64	9.714	2.37	8.38	195.3
AOC65-VEW26	50	36.91	6/21/16	80	22.86	8.695	2.18	6.77	263.8
AOC65-VEW27	21	9.17	6/21/16	0940	22.53	27.11	0.11	6.44	-169.8
AOC65-VEW28A	120	82.62	6/21/16	0910a	25.65	0.586	6.95	7.00	207.4
AOC65-VEW28B	179	94.3	6/21/16		24.16	0.612	3.76	7.04	189.8
AOC65-VEW29	40	29.77	6/21/16	1110	22.83	0.699	0.01	6.67	-196.9
AOC65-VEW30	24.5	24.23	6/21/16						
AOC65-VEW31	40	30.15	6/21/16	1120	22.98	2.774	0.08	6.34	26.4
AOC65-VEW32	24	9.13	6/21/16	1135	22.34	0.474	0.33	7.06	133.9
AOC65-VEW33	24.5	24.37	6/22/16						
AOC65-PZ01-LGR	132.35	88.53	6/20/16	1160	23.42	0.456	11.79	7.05	241.0
AOC65-PZ02-LGR	50.26	40.44		1140	22.35	6.286	4.28	6.81	243.0
AOC65-PZ03-LGR	134.2	100.13			22.97	0.638	10.68	7.12	391.7
AOC65-PZ04-LGR	43.1	36.34			22.80	6.795	2.38	6.70	387.9
AOC65-PZ05-LGR	126.87	64.62		1150	23.74	0.819	6.60	7.02	228.7
AOC65-PZ06-LGR	43.64	36.34	6/21/16	1050	22.43	0.623	4.76	6.71	269.0
AOC65-TSW-01	40	31.86	6/21/16	0900	22.74	7.117	0.06	6.13	203.7
AOC65-TSW-02	40	31.39	6/21/16		22.78	6.050	0.14	6.29	184.5
AOC65-TSW-03	40	28.59	6/21/16	0955	22.84	32.99	0.09	6.35	252.3
AOC65-TSW-04	40	28.40	6/21/16	1005	22.67	44.08	0.18	6.23	236.0
AOC65-TSW-05	40	29.78	6/21/16	1046	22.50	0.537	3.17	7.10	228.6
AOC65-TSW-06	51	35.88	6/22/16	0800	22.30	0.722	0.06	6.59	-53.6
AOC65-TSW-07	40	28.11	6/21/16	1020	22.31	10.69	0.02	6.47	237.6
AOC65-SIW-01	25	13.30	6/22/16	0912					
OC65-North-IC	4.2								
AOC65-Middle-IC	9.65	7.77		0905					
AOC65-South-IC	11.77	8.58		0846					

g

orange

light pink

Faint pink  
light pink

ISCO Sampling AOC-65

Personnel: Elliott, Dietert

Permit required samples shaded gray.  
**Bold = Performance Monitoring Samples**

Well ID	TD/pump depth	Water Level ('BTOC)	Sample Date	Sample Time	Temp. (°C)	Cond. (ms/cm <sup>2</sup> )	DO	pH	ORP
LS-5	NA		9/6/14	1215	22.63	0.620	✓	6.94	✓
LS-6	NA			1735	21.98	0.723	✓	6.78	✓
LS-7	NA			1110	22.32	0.682	✓	6.75	✓
OFR-3	NA			1610	28.89	0.556	✓	6.97	✓
RFR-10	NA			1520	22.63	0.613	✓	7.07	✓
RFR-11	NA			1400	22.43	0.727	✓	6.83	✓
CS-MW36-LGR	361.5		9/12/16	1021	23.17	1.744	✓	7.17	✓
CS-MW8-LGR	302			1053	22.52	0.667	✓	6.83	✓
CS-MW7-LGR	293		9/12/16	0905	21.70	0.683	✓	6.81	✓
CS-MW6-LGR	314			0943	22.84	0.587	✓	6.95	✓
AOC65-VEW13-LGR	41	32.13	10/4/16		22.71	0.648	2.55	6.68	185.6
AOC65-VEW14-LGR	61	60.43	10/4/16		22.79	0.782	0.50	6.82	-25.6
AOC65-VEW15-UGR	13	7.23	10/4/16	1340	26.00	1.069	0.02	6.93	130.7
AOC65-VEW16-LGR	41	24.92	10/4/16		22.85	0.639	0.09	6.70	-83.7
AOC65-VEW17-LGR	52.5	51.02	10/4/16		22.80	0.832	1.48	6.69	-47.8
AOC65-VEW18-LGR	56	32.25	10/5/16	0840	22.89	8.107	3.06	7.20	200.5
AOC65-VEW19-UGR	26	9.48	10/4/16	0934	23.04	13.17	21.53	8.94	-16.3
AOC65-VEW20	25.7	11.67	10/4/16		22.99	0.746	0	7.13	262.3
AOC65-VEW21	27	13.13	10/4/16	0851	22.46	0.705	0.07	6.99	283.1
AOC65-VEW22	50.5	48.63	10/4/16		22.53	0.651	3.53	6.65	271.3
AOC65-VEW23	21	10.71	10/4/16	0923	23.09	3.075	0.10	6.39	112.0
AOC65-VEW24	50	49.11	10/4/16		22.72	3.358	3.68	6.64	247.9
AOC65-VEW25	21.5	15.99	10/4/16	0950	22.72	3.358	3.18	6.61	247.9
AOC65-VEW26	50	39.33	10/4/16		22.79	10.38	1.43	6.66	264.5
AOC65-VEW27	21	8.68	10/4/16	1315	23.69	33.72	0.11	6.60	102.0
AOC65-VEW28A	120	108.10			23.88	0.737	5.76	7.03	186.6
AOC65-VEW28B	179	? dark purple			23.56	0.652	4.03	6.90	199.1
AOC65-VEW29	40	29.67	10/4/16	1355	22.82	0.741	0.03	6.72	-85.5
AOC65-VEW30	24.5	24.24	10/4/16						
AOC65-VEW31	40	30.14	10/4/16	1410	22.87	2.712	0.11	6.41	-46.5
AOC65-VEW32	24	8.57	10/4/16	1430	23.29	0.541	0.05	7.04	196.0
AOC65-VEW33	24.5	24.98							
AOC65-PZ01-LGR	132.35	110.30	10/4/16	0904	22.34	0.671	5.58	6.98	273.6
AOC65-PZ02-LGR	50.26	39.75	10/4/16	1008	22.17	5.701	2.57	6.82	248.0
AOC65-PZ03-LGR	134.2	119.84	10/4/16		22.19	0.589	6.26	6.96	300.3
AOC65-PZ04-LGR	43.1	36.33	10/4/16		22.53	0.770	3.03	6.62	394.4
AOC65-PZ05-LGR	126.87	42.32	10/4/16	1005	22.53	0.906	5.73	7.09	250.8
AOC65-PZ06-LGR	43.64	36.42	10/4/16	0852	22.44	0.705	0.07	6.99	283.1
AOC65-TSW-01	40	31.86	10/4/16	1300	22.63	8.333	0.34	6.16	225.0
AOC65-TSW-02	40	31.29	10/4/16		22.70	5.897	0.17	6.28	-170.0
AOC65-TSW-03	40	28.54	10/4/16	1105	22.73	34.80	0.31	6.36	251.4
AOC65-TSW-04	40	28.53	10/4/16	1050	22.45	47.40	0.61	6.28	219.9
AOC65-TSW-05	40	29.77	10/5/16	0810	22.39	0.766	1.22	6.78	400.1
AOC65-TSW-06	51	35.89	10/5/16	0830	22.27	0.905	0.27	6.72	-144.4
AOC65-TSW-07	40	28.12	10/4/16	1030	22.12	11.95	0.74	6.43	243.8
AOC65-SIW-01	25	12.85	10/5/16	0930	22.88				
AOC65-North-IC	4.2								
AOC65-Middle-IC	9.65	7.36		0920	22.88				
AOC65-South-IC	11.77	8.32		0905	22.88				

cramp

BD

BD

PZ-06 36.42 10/4/16 0852 22.44 0.588 4.52 6.80 287.7  
 VEW25 15.99 10/4/16 0950 ~~23.17~~ 12.81 1.28 7.32 244.7

ISCO Sampling AOC-65

Personnel: Elliott + Dietert

Permit required samples shaded gray.

Bold = Performance Monitoring Samples

Well ID	TD / pump depth	Water Level ('BTOC)	Sample Date	Sample Time	Temp. (°C)	Cond. (ms/cm <sup>2</sup> )	DO	pH	ORP
LS-5	NA	/	12/5/14	0940	22.26	0.657	/	6.92	/
LS-6	NA	/		1010	21.98	0.741	/	6.63	/
LS-7	NA	/		0910	22.96	0.659	/	6.65	/
OFR-3	NA	/		1040	25.21	0.586	/	7.05	/
RFR-10	NA	/		1105	22.12	0.641	/	6.95	/
RFR-11	NA	/		1130	22.57	0.663	/	6.94	/
CS-MW36-LGR	361.5	/	12/12/16	0928	19.44	1.494	2.28	7.05	369.8
CS-MW8-LGR	302	/		0940	21.99	0.641	1.33	6.97	344.0
CS-MW7-LGR	293	/		1040	21.27	0.660	1.28	6.97	325.4
CS-MW6-LGR	314	/		0853	21.61	0.569	1.48	7.02	443.2
AOC65-VEW13-LGR	41	34.17	11/30/16		22.49	0.644	0.05	6.86	-59.2
AOC65-VEW14-LGR	61	60.48	11/30/16		22.18	0.006	5.04	7.02	124.1
AOC65-VEW15-UGR	13	7.28		0952	24.91	0.834	0.23	7.02	115.1
AOC65-VEW16-LGR	41	29.97			22.55	0.602	0.09	6.88	11.1
AOC65-VEW17-LGR	52.5	51.12	11/30/16		22.26	0.819	1.24	6.82	-63.3
AOC65-VEW18-LGR	56	37.46	11/30/16	1050	22.78	7.179	3.42	7.24	182.3
AOC65-VEW19-UGR	26	10.78	11/30/16	0825	23.50	9.740	10.27	9.02	128.0
AOC65-VEW20	25.7	11.91	11/30/16		23.14	0.724	0.12	7.23	212.0
AOC65-VEW21	27	13.88	11/29/16		22.94	0.668	0.02	7.03	219.1
AOC65-VEW22	50.5	49.14			22.45	0.645	3.25	6.66	223.1
AOC65-VEW23	21	12.7	11/29/16	1323	23.45	2.940	0.01	6.42	199.3
AOC65-VEW24	50	DRY							
AOC65-VEW25	21.5	17.71	11/29/16	1347	23.62	12.42	0.79	7.42	240.2
AOC65-VEW26	50	41.45	11/30/16		22.37	9.848	1.75	6.72	185.5
AOC65-VEW27	21	10.10	11/30/16	0843	23.91	33.38	0.22	6.39	1.9
AOC65-VEW28A	120	108.52			19.68	0.609	6.47	7.24	156.9
AOC65-VEW28B	179	109.81			20.17	0.611	5.64	7.18	174.3
AOC65-VEW29	40	30.81	11/30/16	0940	22.60	0.705	0.03	6.82	-136.7
AOC65-VEW30	24.5	24.33							
AOC65-VEW31	40	30.16	11/30/16	0925	22.61	2.060	0.08	6.57	-45.6
AOC65-VEW32	24	4.53			23.70	0.517	0.09	7.21	170.7
AOC65-VEW33	24.5	24.40	11/30/16						
AOC65-PZ01-LGR	132.35	113.35	11/29/16	1313	22.16	0.617	6.55	7.10	280.1
AOC65-PZ02-LGR	50.26	43.82		1404	22.23	5.582	3.86	7.02	229.3
AOC65-PZ03-LGR	134.2	122.61			21.57	0.514	6.34	6.91	278.1
AOC65-PZ04-LGR	43.1	36.42			22.58	0.733	2.54	6.70	301.1
AOC65-PZ05-LGR	126.87	106.29		1400	21.32	0.807	7.06	7.09	229.4
AOC65-PZ06-LGR	43.64	36.45		1257	22.92	0.669	0.08	7.02	249.5
AOC65-TSW-01	40	31.87	11/29/16	1533	22.67	6.759	0.04	6.72	138.8
AOC65-TSW-02	40	31.49	11/29/16		22.78	5.047	-0.04	6.34	-175.2
AOC65-TSW-03	40	28.61	11/29/16	1510	22.76	31.84	0.14	6.38	214.7
AOC65-TSW-04	40	28.38	11/29/16	1446	22.36	43.66	0.33	6.39	203.2
AOC65-TSW-05	40	29.78	11/30/16	1125	21.73	0.631	0.70	6.87	172.8
AOC65-TSW-06	51	35.89	11/30/16	1105	22.05	0.710	0.00	6.87	-61.5
AOC65-TSW-07	40	28.19	11/29/16	1430	22.09	10.666	0.01	6.53	215.3
AOC65-SIW-01	25	13.23	11/30/16	1205					
AOC65-North-IC	4.2								
AOC65-Middle-IC	9.65	7.77		1153					
AOC65-South-IC	11.77	8.63		1140					

369.8  
344.0  
325.4  
443.2

Orange

pink dye





ISCO Sampling AOC-65

Personnel: Elliott & Oertel

Permit required samples shaded gray.

Bold = Performance Monitoring Samples  
candles installed

Well ID	TD / pump depth	Water Level (BTOC)	Sample Date	Sample Time	Temp. (°C)	Cond. (ms/cm <sup>2</sup> )	DO	pH	ORP
LS-5	NA								
LS-6	NA								
LS-7	NA								
OFR-3	NA								
RFR-10	NA								
RFR-11	NA								
CS-MW36-LGR	361.5		3/6/17	1027	21.06	0.880	1.80	6.78	264.8
CS-MW8-LGR	302			1058	21.77	0.665	1.13	6.67	256.8
CS-MW7-LGR	293			1148	21.42	0.685	0.79	6.65	245.0
CS-MW6-LGR	314			0852	21.64	0.590	1.34	6.82	264.4
AOC65-VEW13-LGR	41	34.59	4/3/17		22.79	0.659	1.17	6.79	-91.8
AOC65-VEW14-LGR	60.761	60.48		Dry					
AOC65-VEW15-UGR	13	7.22		1105	21.82	0.584	5.22	7.36	213.4
AOC65-VEW16-LGR	41	29.97			22.89	0.594	0.30	6.85	-72.7
AOC65-VEW17-LGR	52.5	51.11			22.78	0.745	0.89	6.73	-39.2
AOC65-VEW18-LGR	56	40.42		1200	23.04	5.666	3.03	7.10	219.7
AOC65-VEW19-UGR	26	11.73		1045	pink / light purple; VOAs went clear				
AOC65-VEW20	25.7	11.22			22.33	0.642	2.56	7.43	204.2
AOC65-VEW21	27	13.69	3/23/17		22.47	0.614	3.37	7.10	315.2
AOC65-VEW22	50.5	49.41			20.44	0.599	4.02	6.77	241.8
AOC65-VEW23	21	21.15		Dry	20.50				
AOC65-VEW24	50.5	50.31							
AOC65-VEW25	21.5	17.9		1025	22.30	9.230	2.25	7.59	235.7
AOC65-VEW26	50	45.4	4/3/17		22.66	9.202	2.78	6.89	243.1
AOC65-VEW27	21	10.37	4/3/17	0955		medium purple / red; VOAs stayed red			
AOC65-VEW28A	120								
AOC65-VEW28B	179								
AOC65-VEW29	40	29.85	4/3/17	1120	23.14	0.646	2.10	6.75	118.7
AOC65-VEW30	24.5	24.24		Dry					
AOC65-VEW31	40	30.17		1135	23.06	1.150	0.94	6.68	48.8
AOC65-VEW32	24	10.81		1145		mauve; VOAs went clear; silt			
AOC65-VEW33	24.5	24.27							
AOC65-PZ01-LGR	132.35	113.71	3/23/17	0953	21.63	0.583	6.19	7.01	295.0
AOC65-PZ02-LGR	50.26	42.56		1043	22.33	3.596	3.169	7.13	255.2
AOC65-PZ03-LGR	134.2	123.51			21.31	0.542	6.20	6.98	332.9
AOC65-PZ04-LGR	43.1	36.37			22.78	0.716	1.73	6.88	357.2
AOC65-PZ05-LGR	126.87	86.60		1040	21.70	0.382	8.40	7.02	261.5
AOC65-PZ06-LGR	43.64	36.40		0950	22.66	0.599	3.53	6.76	340.2
AOC65-TSW-01	40	32.60	4/3/17	1025		medium purple / red; VOAs went clear			
AOC65-TSW-02	40	31.51	4/3/17		22.72	4.099	0.90	6.64	-120.3
AOC65-TSW-03	40	28.73	3/23/17	1130	23.95	29.15	0.26	6.42	240.9
AOC65-TSW-04	40	28.84		1115	23.61	39.11	0.25	6.40	218.2
AOC65-TSW-05	40	29.92	4/3/17	1410		pink; VOAs went clear			
AOC65-TSW-06	51	35.87		1420	22.72	0.697	0.44	6.75	-56.3
AOC65-TSW-07	40	28.19	3/23/17	1100	22.41	9.666	0.75	6.50	-26.9
AOC65-SIW-01	25	13.50	4/3/17	1510		dark purple; VOAs turned light brown			
AOC65-North-IC	4.2	DRY							
AOC65-Middle-IC	9.65	7.90		1450		purple; VOAs went clear			
AOC65-South-IC	11.77	8.68		1440		dark purple; VOAs stayed purple			

Temp 22.72

\* VEW 23: E-line covered in silt. Not enough water for sample.