

**JUNE 2016**

**On-Post**

**Quarterly Groundwater Monitoring Report**



*Prepared For*

**Department of the Army  
Camp Stanley Storage Activity  
Boerne, Texas**

**September 2016**

## EXECUTIVE SUMMARY

- Groundwater samples were collected from all five wells scheduled for monitoring in June 2016. An unscheduled sample was also obtained from CS-MW5-LGR to monitor recent volatile organic compound (VOC) detections reported in this well since December 2015.
- CSSA experienced unusually high precipitation volumes during the 2<sup>nd</sup> quarter of 2016; therefore, the aquifer experienced a significant increase from March 17 to June 20, 2016. The weather station (WS) at Area of Concern (AOC)-65 (AOC-65 WS) recorded 19.39 inches of rainfall, and the B-3 weather station did not record a complete set of data due to a malfunction during this same time period. Likewise, the San Antonio International Airport weather station (KSAT) measured 17.27 inches of rainfall during the 2<sup>nd</sup> quarter of 2016. The average rainfall for this area from April to June is 11.39 inches.
- At CSSA, the Middle Trinity aquifers' average groundwater elevation in June 2016 increased 106.82 feet from the elevations measured in March 2016. The average depth to water in the wells was 81.92 feet below top of casing (BTOC) or 1159.63 feet above mean sea level (MSL). As such, the Trinity-Glen Rose Groundwater Conservation District (TGRGCD) remains in Stage 1 Moderate Drought conditions since August 13, 2015. For the adjacent Edwards aquifer, the San Antonio Water System (SAWS) also remains in 'year round watering hours' since December 2, 2015.
- The maximum contaminant level (MCL) was exceeded in monitoring well CS-MW5-LGR for trichloroethene (TCE) in June 2016.
- No wells sampled had metal detections above their corresponding MCL, action level (AL), or secondary standard (SS) in June 2016.
- Three drinking water wells (CS-1, CS-10, and CS-12) showed trace detections, below the RL, of PCE in June 2016. These wells were re-sampled in July where no VOCs were detected.
- Thirty-seven Westbay Well 01-04 zones were scheduled for sampling in June 2016. Fifteen of the 35 zones sampled had VOC concentrations above the MCL.
- Updated data quality objectives (DQOs) and the long term monitoring optimization (LTMO) reports have been submitted and approved by the Texas Commission on Environmental Quality (TCEQ) and United States Environmental Protection Agency (USEPA). The new DQOs and LTMO will be implemented during the September 2016 groundwater event. Changes will include modifications in the sample collection frequency and analytical parameters in selected wells.

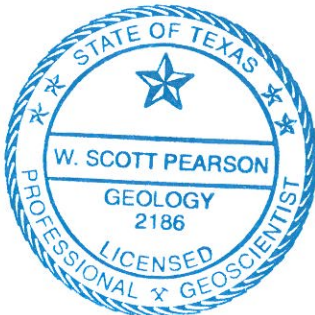
**GEOSCIENTIST CERTIFICATION**

**JUNE 2016 ON-POST QUARTERLY GROUNDWATER MONITORING REPORT**

**FOR**

**DEPARTMENT OF THE ARMY  
CAMP STANLEY STORAGE ACTIVITY  
BOERNE, TEXAS**

I, W. Scott Pearson, Professional Geologist (P.G.), hereby certify that the June 2016 On-Post Quarterly Groundwater Monitoring Report for the Camp Stanley Storage Activity installation in Boerne, Texas accurately represents the site conditions of the subject area. This certification is limited only to geoscientific products contained in the subject report and is made on the basis of written and oral information provided by the CSSA Environmental Office, laboratory data provided by APPL Laboratories, and field data obtained during groundwater monitoring conducted at the site in June 2016, and is true and accurate to the best of my knowledge and belief.



*W. Scott Pearson*

\_\_\_\_\_  
W. Scott Pearson, P.G.  
State of Texas  
Geology License No. 2186

*September 28, 2016*

\_\_\_\_\_  
Date

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**ACRONYMS AND ABBREVIATIONS**

µg/L	microgram per liter
1,1-DCE	1,1-dichloroethene
§3008(h) Order	RCRA 3008(h) Administrative Order on Consent
AL	Action Level
AOC	Area of Concern
APPL	Agriculture and Priority Pollutants Laboratories, Inc.
BS	Bexar Shale
BTOC	below top of casing
CC	Cow Creek
<i>cis</i> -1,2-DCE	<i>cis</i> -1,2-Dichloroethene
COC	constituents of concern
CSSA	Camp Stanley Storage Activity
DQO	Data Quality Objectives
HSP	Health and Safety Plan
ISCO	In-Situ Chemical Oxidation
LGR	Lower Glen Rose
LTMO	Long-Term Monitoring Optimization
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MSL	mean sea level
NA	Not Available
PCE	Tetrachloroethene
P.G.	Professional Geologist
Parsons	Parsons Government Services, Inc.
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
SAP	Sampling and Analysis Plan
SAWS	San Antonio Water System
SS	Secondary Standard
SWMU	Solid Waste Management Units
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TGRGCD	Trinity-Glen Rose Groundwater Conservation District
<i>trans</i> -1,2-DCE	<i>trans</i> -1,2-Dichloroethene
UGR	Upper Glen Rose
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WS	Weather Station

## JUNE 2016 GROUNDWATER MONITORING REPORT CAMP STANLEY STORAGE ACTIVITY, TEXAS

### 1.0 INTRODUCTION

This report presents results from the on-post quarterly sampling performed at Camp Stanley Storage Activity (CSSA) in June 2016. Laboratory analytical results are presented along with potentiometric contour maps. Results from all four 2016 quarterly monitoring events (March, June, September, and December) will be described in detail in the 2016 Annual Report. The Annual Report will also provide an interpretation of all analytical results and an evaluation of any temporal or spatial trends observed in the groundwater contaminant plume during investigations. For this specific quarter, groundwater monitoring was performed June 6 through 20, 2016 by Parsons Government Services, Inc. (Parsons).

Current objectives of the groundwater monitoring program are to determine groundwater flow direction and elevations, determine groundwater contaminant concentrations for characterization purposes, and identify meteorological and seasonal variations in physical and chemical properties. **Appendix A** identifies the data quality objectives (DQOs) for CSSA's groundwater monitoring program, along with an evaluation of whether each DQO was attained. The objectives listed in **Appendix A** also reference appropriate sections of the Resource Conservation and Recovery Act (RCRA) §3008(h) **Administrative Order on Consent** [§3008(h) Order].

The CSSA groundwater monitoring program follows the provisions of the groundwater monitoring program DQOs as well as the recommendations of the **Three-Tiered Long Term Monitoring Network Optimization (LTMO) Evaluation (Parsons, 2010)** which provided recommendations for sampling based on an LTMO study performed for the CSSA groundwater monitoring program. LTMO study sampling frequencies were implemented on-post in December 2005, as approved by the Texas Commission on Environmental Quality (TCEQ) and the United States Environmental Protection Agency (USEPA). The LTMO evaluation was updated in 2010 using groundwater data from monitoring conducted between 2005 and 2009. It has been approved by the TCEQ and USEPA and was implemented on- and off-post in June 2011. An update to the LTMO and DQOs has been submitted and approved as part of the revision of the USEPA §3008(h) Order. The proposed changes/updates were approved by the TCEQ and USEPA April 22 and May 5, 2016 respectively. These changes will be briefed to the public in the 2016 Annual Fact Sheet.

## 2.0 POST-WIDE FLOW DIRECTION AND GRADIENT

After above average rainfall in 2015 and continued steady rain events in early 2016, the San Antonio Water System (SAWS) restrictions remain under ‘year round watering hours’ since December 2, 2015. The Trinity-Glen Rose Groundwater Conservation District (TGRGCD) remains in Stage 1 water restrictions since August 13, 2015.

The 30-year precipitation normal for the San Antonio area is 10.77 inches of rainfall for the three-month period of April through June. Over the 3-month period of record, the weather station (WS) at Area of Concern (AOC)-65 (AOC-65 WS) recorded 19.39 inches of rainfall. The B-3 weather station (B-3 WS) did not record a complete set of data for this timeframe due to equipment malfunction. The station was repaired and back online by May 31. During the same timeframe, the KSAT weather station located at the San Antonio International Airport recorded 17.27 inches of precipitation. The rainfall was consistent through May and then tapered off in June. A majority of the rain fell in April (9.04 inches) with six events having greater than one inch of rain in April and May.

Fifty-five water level measurements were recorded on June 13, 2016 from on- and off-post monitoring wells completed in the Lower Glen Rose (LGR), Bexar Shale (BS), and Cow Creek (CC) formational members of the Middle Trinity Aquifer (**Tables 2.1 and 2.2**). The groundwater potentiometric surface maps illustrating groundwater elevations from the LGR, BS, and CC zones in June 2016 are shown in **Figures 2.1, 2.2, and 2.3**, respectively.

The June 2016 potentiometric surface map for LGR-screened wells (**Figure 2.1**) exhibited a wide range of groundwater elevations, from a minimum of 1,040.97 feet above mean sea level (MSL) at B3-EXW05 to a maximum of 1,184.27 feet above MSL at B3-EXW04. Groundwater elevations are generally higher in the northern and central portions of CSSA, and decrease to the southwest and southeast. As measured in all non-pumping LGR wells, the average groundwater elevation in June 2016 increased 106.82 feet from the elevations measured in March 2016. This increase in aquifer elevation is expected after above average rain fell during this timeframe compounded by significant rainfall in 2015. The groundwater elevation is approximately 133 feet above the 13.5 year average elevation measured in CSSA monitoring wells (**Figure 2.4**).

Well CS-MW4-LGR, located in the central portion of CSSA, typically has one of the highest groundwater elevations of LGR-screened wells. Under average and above-average aquifer elevations, the groundwater level is 20 to 30 feet higher than the nearest comparable wells (CS-MW2-LGR and CS-MW5-LGR), creating a pronounced groundwater mound in the central portion of the facility. In June 2016 this mounding effect was observable as the elevation in CS-MW4-LGR was 19 feet and 27 feet higher than CS-MW2-LGR and CS-MW5-LGR, respectively. Long-term monitoring has ascertained that when groundwater in the vicinity of CS-MW4-LGR rises above about 970 feet MSL, the mounding effect is evident. As measured in June 2016, the water elevation at CS-MW4-LGR was 1,182.31 feet MSL, and the typical mounding effect was evident.

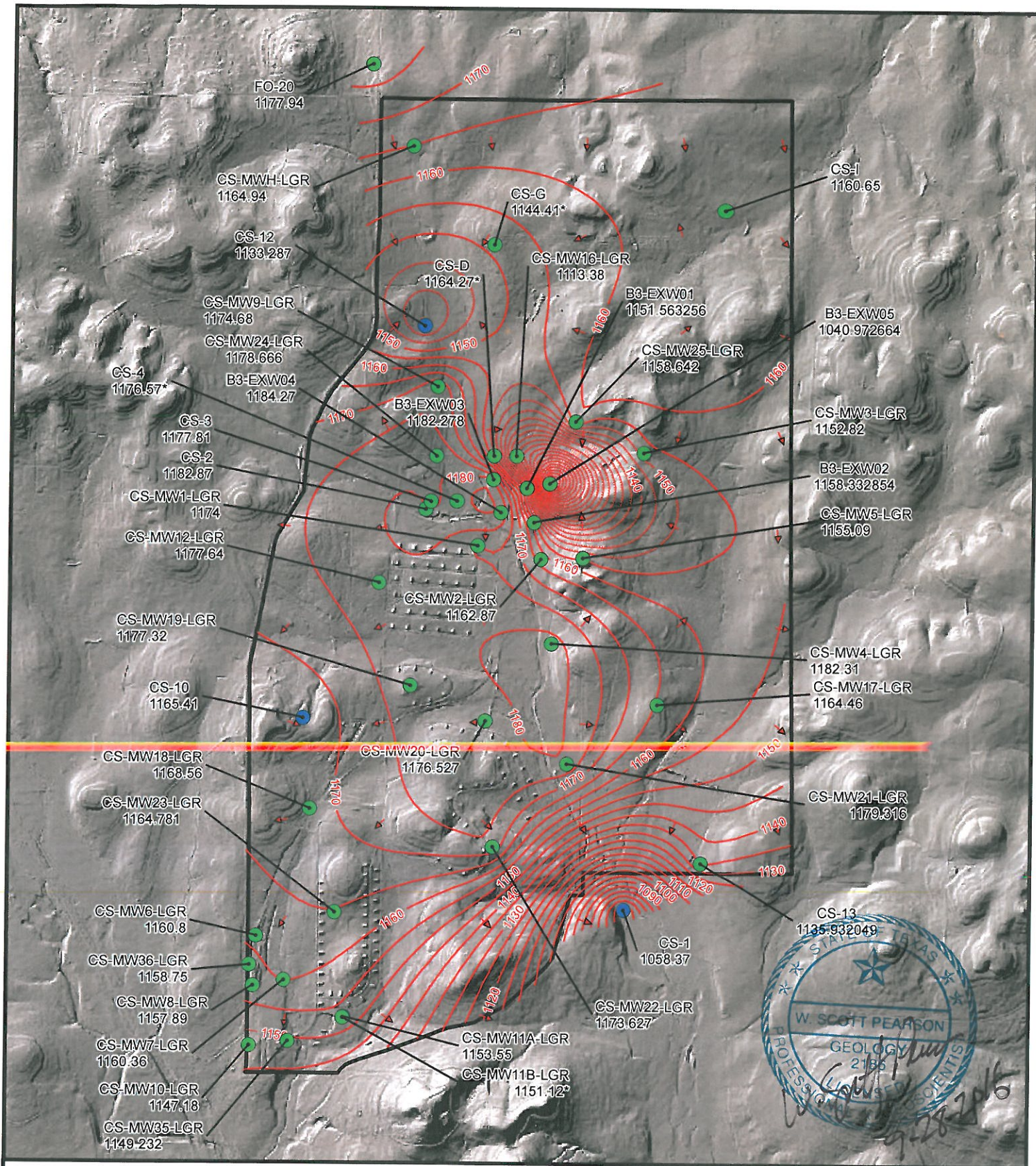


**Table 2.1  
Measured Groundwater Elevation  
June 2016**

Well ID:	TOC elevation (ft MSL)	Depth to Groundwater (ft BTOC)	Groundwater Elevation (ft MSL)	Formations Screened			Date
				LGR	BS	CC	
CS-1	1169.27	110.90	1058.37	X			6/13/2016
<b>CS-2</b>	<b>1237.59</b>	<b>54.72</b>	<b>1182.87</b>	X	?		6/13/2016
CS-3	1240.17	62.36	1177.81	X			6/13/2016
CS-4	1229.28	52.71	1176.57	X			6/13/2016
<b>CS-10</b>	<b>1331.51</b>	<b>166.10</b>	<b>1165.41</b>	ALL			6/13/2016
<b>CS-12</b>	<b>1274.09</b>	<b>140.80</b>	<b>1133.29</b>	ALL			6/13/2016
<b>CS-13</b>	<b>1193.26</b>	<b>57.33</b>	<b>1135.93</b>	ALL			6/13/2016
CS-D	1236.03	71.76	1164.27	X			6/13/2016
CS-MWG-LGR	1328.14	183.73	1144.41	X			6/13/2016
CS-MWH-LGR	1319.19	154.26	1164.93	X			6/13/2016
CS-I	1315.20	154.55	1160.65	X			6/13/2016
CS-MW1-LGR	1220.73	46.73	1174.00	X			6/13/2016
CS-MW1-BS	1221.09	111.56	1109.53		X		6/13/2016
CS-MW1-CC	1221.39	87.78	1133.61			X	6/13/2016
CS-MW2-LGR	1237.08	74.21	1162.87	X			6/13/2016
CS-MW2-CC	1240.11	128.62	1111.49			X	6/13/2016
CS-MW3-LGR	1334.14	181.32	1152.82	X			6/13/2016
CS-MW4-LGR	1209.71	27.40	1182.31	X			6/13/2016
CS-MW5-LGR	1340.24	185.15	1155.09	X			6/13/2016
CS-MW6-LGR	1232.25	71.45	1160.80	X			6/13/2016
CS-MW6-BS	1232.67	84.22	1148.45		X		6/13/2016
CS-MW6-CC	1233.21	82.91	1150.30			X	6/13/2016
CS-MW7-LGR	1202.27	41.91	1160.36	X			6/13/2016
CS-MW7-CC	1201.84	51.68	1150.16			X	6/13/2016
CS-MW8-LGR	1208.35	50.46	1157.89	X			6/13/2016
CS-MW8-CC	1206.13	56.03	1150.10			X	6/13/2016
CS-MW9-LGR	1257.27	82.59	1174.68	X			6/13/2016
CS-MW9-BS	1256.73	82.86	1173.87		X		6/13/2016
CS-MW9-CC	1255.95	105.51	1150.44			X	6/13/2016
CS-MW10-LGR	1189.53	42.35	1147.18	X			6/13/2016
CS-MW10-CC	1190.04	42.05	1147.99			X	6/13/2016
CS-MW11A-LGR	1204.03	50.48	1153.55	X			6/13/2016
CS-MW11B-LGR	1203.52	52.40	1151.12	X			6/13/2016
CS-MW12-LGR	1259.07	81.43	1177.64	X			6/13/2016
CS-MW12-BS	1258.37	101.51	1156.86		X		6/13/2016
CS-MW12-CC	1257.31	106.85	1150.46			X	6/13/2016
CS-MW16-LGR*	1244.60	131.22	1113.38	X			6/13/2016
CS-MW16-CC	1244.51	116.37	1128.14			X	6/13/2016
B3-EXW01	1245.26	93.70	1151.56	X			6/13/2016
B3-EXW02	1249.66	91.33	1158.33	X			6/13/2016
B3-EXW03	1235.11	52.83	1182.28	X			6/13/2016
B3-EXW04*	1228.46	44.19	1184.27	X			6/13/2016
B3-EXW05*	1279.46	238.49	1040.97	X			6/13/2016
CS-MW17-LGR	1257.01	92.55	1164.46	X			6/13/2016
CS-MW18-LGR	1283.61	115.05	1168.56	X			6/13/2016
CS-MW19-LGR	1255.53	78.21	1177.32	X			6/13/2016
CS-MW20-LGR	1209.42	32.89	1176.53	X			6/13/2016
CS-MW21-LGR	1184.53	5.21	1179.32	X			6/13/2016
CS-MW22-LGR	1280.49	106.86	1173.63	X			6/13/2016
CS-MW23-LGR	1258.20	93.42	1164.78	X			6/13/2016
CS-MW24-LGR	1253.90	75.23	1178.67	X			6/13/2016
CS-MW25-LGR	1293.01	134.37	1158.64	X			6/13/2016
CS-MW35-LGR	1186.97	37.74	1149.23	X			6/13/2016
CS-MW36-LGR	1218.74	59.99	1158.75	X			6/13/2016
<b>FO-20</b>	<b>NA</b>	<b>NA</b>	1177.94	ALL			6/13/2016
Number of wells screened in each formation.				<b>38</b>	<b>4</b>	<b>9</b>	
Average groundwater elevation in each formation given in feet (non pumping wells).				<b>1166.20</b>	<b>1147.18</b>	<b>1143.07</b>	
<b>Notes:</b>							
<b>Bold wells:</b> CS-2, CS-9, CS-10, CS-12, CS-13, and FO-20 are open boreholes across more than one formational u							
? = Exact screening information unknown for this well.							
Shaded wells are routinely pumped for either domestic, livestock, or environmental remediation purposes, and therefore are not used in calculating statistics.							
CS-1, CS-9, CS-10, CS-12, and CS-13 are current, inactive, or future drinking water wells.							
CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.							
* = submersible pump running at time of water level measurement.							
Formational average groundwater elevation is calculated from non-pumping wells screened in only one format							
All measurements given in feet.							
NA = Data not available							

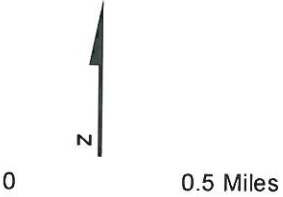
**Table 2.2**  
**Change in Groundwater Elevation from Previous Quarter**  
**June 2016**

Well ID	Mar. 2016 Elevations	June 2016 Elevations	GW elevation change (June minus Mar.)	Formations Screened		
				LGR	BS	CC
CS-1	1011.57	1058.37	<b>46.80</b>	X		
<b>CS-2</b>	<b>1051.01</b>	<b>1182.87</b>	<b>131.86</b>	X	?	
CS-3	1051.96	1177.81	125.85	X		
CS-4	1050.25	1176.57	126.32	X		
<b>CS-10</b>	<b>1047.83</b>	<b>1165.41</b>	117.58		<b>ALL</b>	
<b>CS-12</b>	<b>1048.99</b>	<b>1133.29</b>	84.30		<b>ALL</b>	
<b>CS-13</b>	<b>1037.05</b>	<b>1135.93</b>	<b>98.88</b>		<b>ALL</b>	
CS-D	1046.07	1164.27	118.20	X		
CS-MWG-LGR	1063.30	1144.41	81.11	X		
CS-MWH-LGR	1006.61	1164.93	158.32	X		
CS-I	1059.33	1160.65	101.32	X		
CS-MW1-LGR	1054.86	1174.00	119.14	X		
CS-MW1-BS	1053.60	1109.53	55.93		X	
CS-MW1-CC	1036.35	1133.61	97.26			X
CS-MW2-LGR	1056.08	1162.87	106.79	X		
CS-MW2-CC	1030.81	1111.49	80.68			X
CS-MW3-LGR	1051.94	1152.82	100.88	X		
CS-MW4-LGR	1128.65	1182.31	53.66	X		
CS-MW5-LGR	1053.91	1155.09	101.18	X		
CS-MW6-LGR	1047.29	1160.80	113.51	X		
CS-MW6-BS	1069.95	1148.45	78.50		X	
CS-MW6-CC	1065.41	1150.30	84.89			X
CS-MW7-LGR	1055.09	1160.36	105.27	X		
CS-MW7-CC	1047.58	1150.16	102.58			X
CS-MW8-LGR	1063.12	1157.89	94.77	X		
CS-MW8-CC	1048.09	1150.10	102.01			X
CS-MW9-LGR	1053.42	1174.68	121.26	X		
CS-MW9-BS	1046.47	1173.87	127.40		X	
CS-MW9-CC	1044.53	1150.44	105.91			X
CS-MW10-LGR	1051.03	1147.18	96.15	X		
CS-MW10-CC	1046.51	1147.99	101.48			X
CS-MW11A-LGR	1031.64	1153.55	121.91	X		
CS-MW11B-LGR	1015.68	1151.12	135.44	X		
CS-MW12-LGR	1057.12	1177.64	120.52	X		
CS-MW12-BS	1051.77	1156.86	105.09		X	
CS-MW12-CC	1045.08	1150.46	105.38			X
CS-MW16-LGR*	1045.65	1113.38	67.73	X		
CS-MW16-CC	1032.68	1128.14	95.46			X
B3-EXW01	1041.59	1151.56	109.97	X		
B3-EXW02	955.76	1158.33	202.57	X		
B3-EXW03	1018.39	1182.28	163.89	X		
B3-EXW04*	951.17	1184.27	233.10	X		
B3-EXW05*	981.58	1040.97	59.39	X		
CS-MW17-LGR	1056.06	1164.46	108.40	X		
CS-MW18-LGR	1055.70	1168.56	112.86	X		
CS-MW19-LGR	1071.80	1177.32	105.52	X		
CS-MW20-LGR	1078.01	1176.53	98.52	X		
CS-MW21-LGR	1057.90	1179.32	121.42	X		
CS-MW22-LGR	1051.49	1173.63	122.14	X		
CS-MW23-LGR	1044.85	1164.78	119.93	X		
CS-MW24-LGR	1050.82	1178.67	127.85	X		
CS-MW25-LGR	1053.01	1158.64	105.63	X		
CS-MW35-LGR	1047.64	1149.23	101.59	X		
CS-MW36-LGR	1063.88	1158.75	94.87	X		
<b>FO-20</b>	<b>1082.72</b>	<b>1177.94</b>	95.22		<b>ALL</b>	
Average groundwater elevation change (all wells minus pumping wells)			<b>106.82</b>			
Average groundwater elevation change in each formation (non pumping wells)				<b>110.88</b>	<b>91.73</b>	<b>97.52</b>
<b>Notes:</b>						
<b>Bold wells:</b> CS-2, CS-9, CS-10, CS-12, CS-13, and FO-20 are open boreholes across more than one formational unit.						
? = Exact screening information unknown for this well.						
Shaded wells are routinely pumped for either domestic, livestock, or environmental remediation purposes, and therefore are not used in calculating statistics.						
CS-1, CS-9, CS-10, CS-12, and CS-13 are current, inactive, or future drinking water wells.						
CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.						
* = submersible pump running at time of water level measurement.						
Formational average groundwater elevation change is calculated from non-pumping wells screened in only one formation.						
All measurements given in feet.						
NA = Data not available						

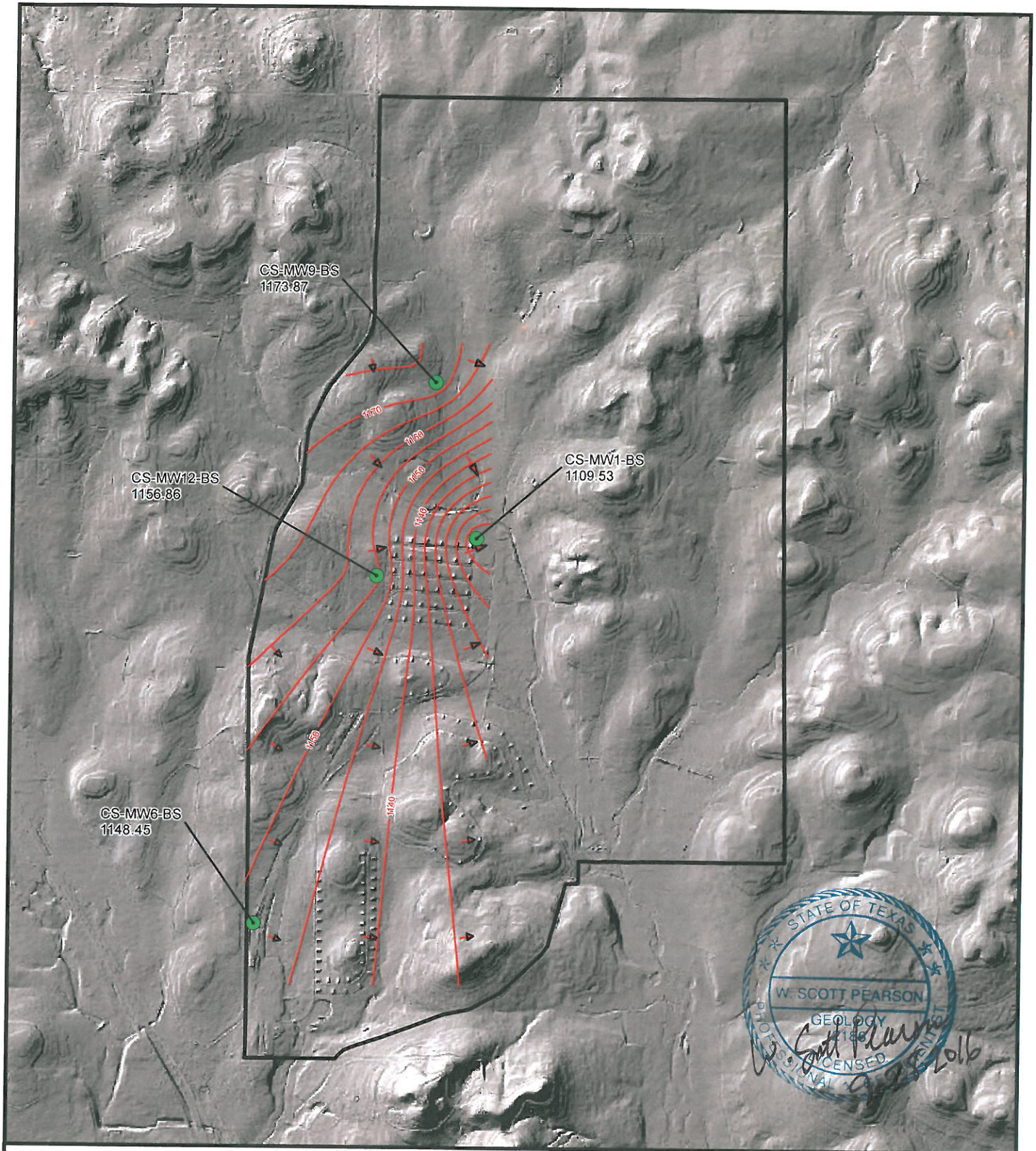


- Flow direction
- LGR Groundwater Contours
- Outer fence
- LGR Wells and groundwater elevation (ft above msl)
- Drinking water wells (may be completed in LGR, BS, and/or CC)

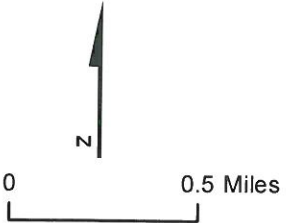
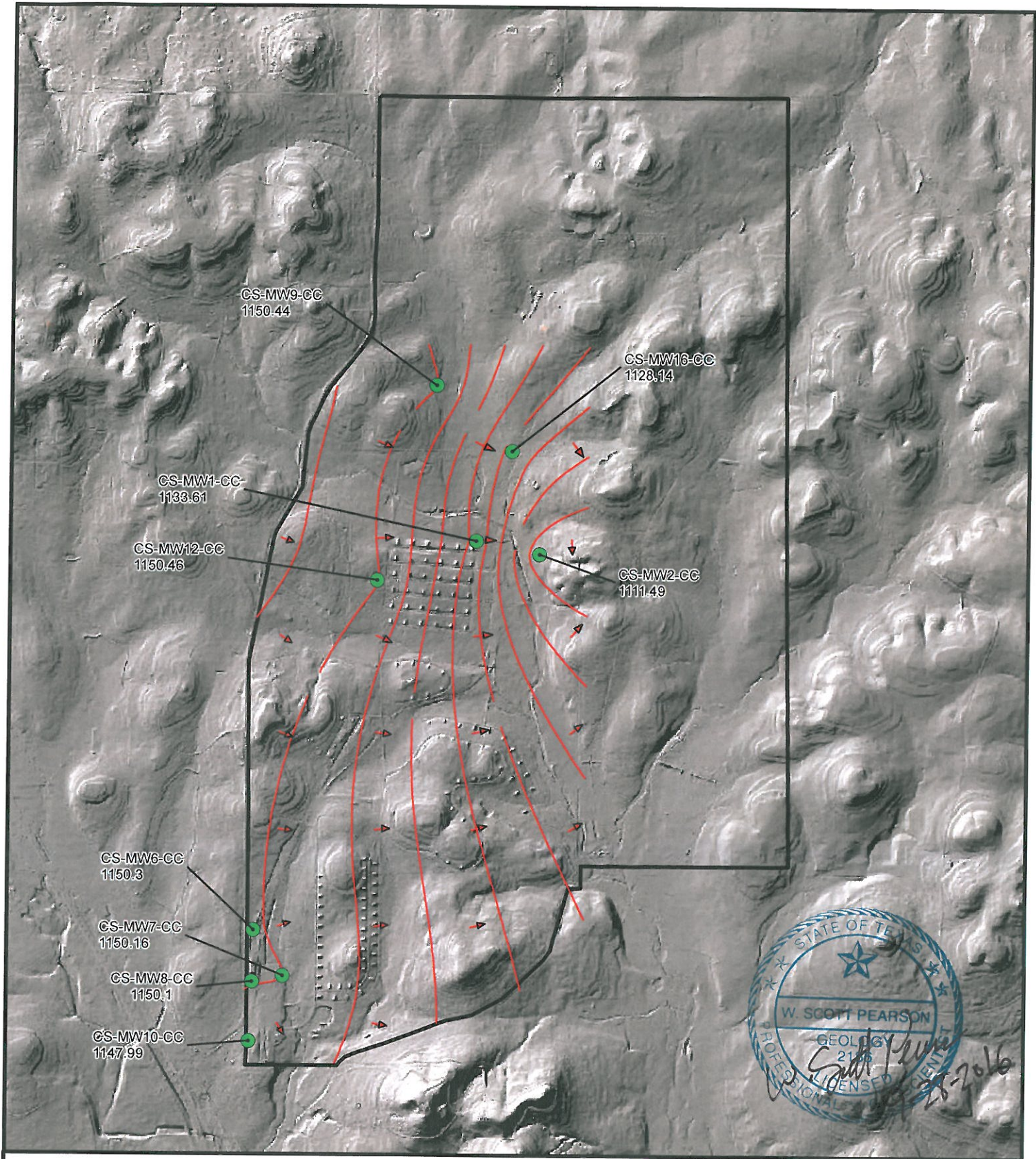
\* Not a fully penetrating well into LGR. Groundwater elevation not used in contouring



**Figure 2.1**  
 June 2016 Potentiometric  
 Surface Map, LGR Wells  
 Camp Stanley Storage Activity  
**PARSONS**



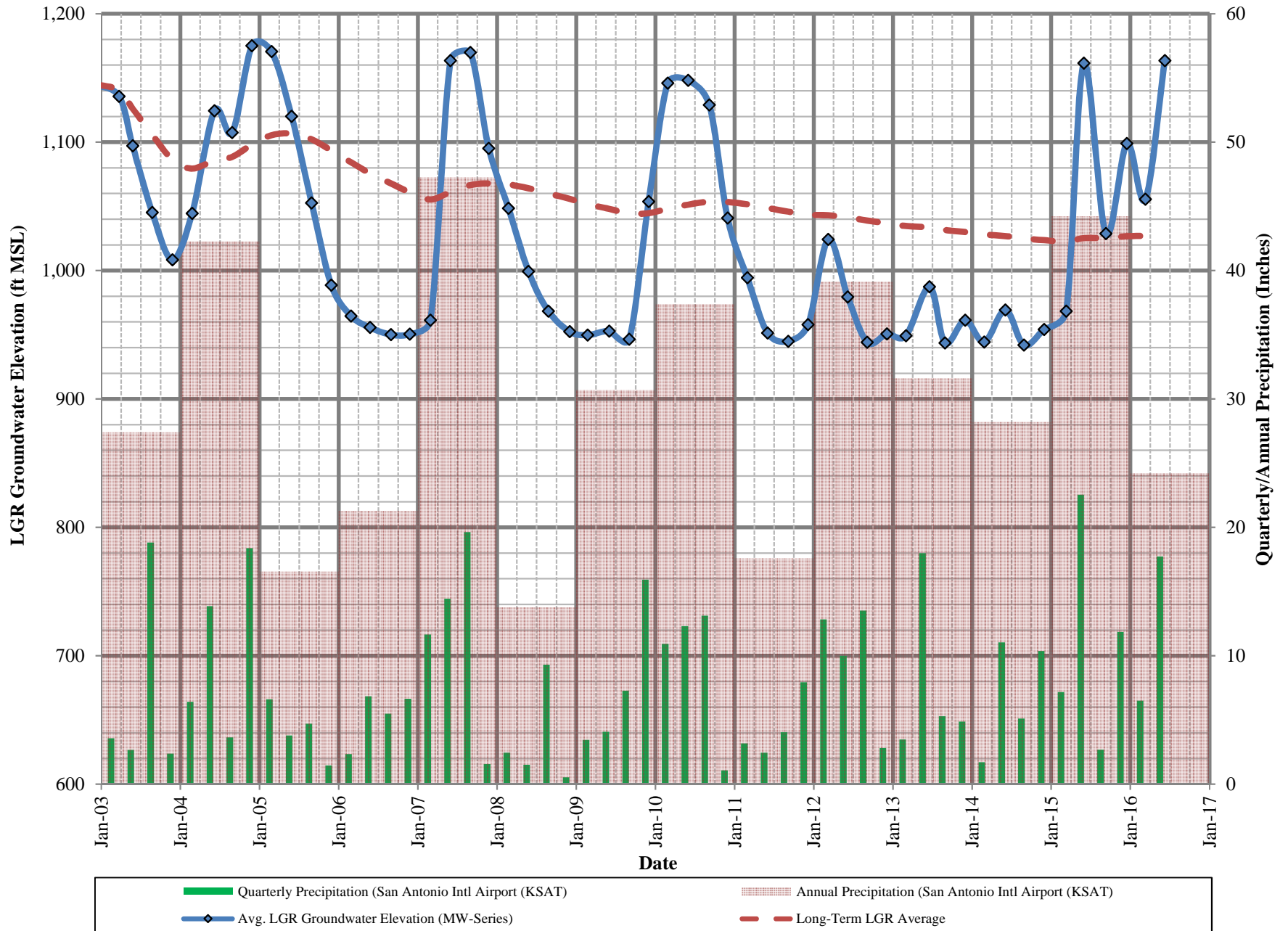
**Figure 2.2**  
 June 2016 Potentiometric  
 Surface Map, BS Wells  
 Camp Stanley Storage Activity  
**PARSONS**



- Flow direction
- Outer fence
- CC Groundwater Contours
- CC Wells and groundwater elevation (ft above msl)

**Figure 2.3**  
 June 2016 Potentiometric  
 Surface Map, CC Wells  
 Camp Stanley Storage Activity  
**PARSONS**

**Figure 2.4 - Average LGR Groundwater Elevations and Quarterly/Annual Precipitation**



It should be noted that well pumping on and around CSSA affects the potentiometric surface. On-post wells CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05 are cyclically pumped as part of the Bioreactor remediation system at Solid Waste Management Unit (SWMU) B-3. These remediation wells provide groundwater to the Bioreactor system, and are automatically operated based upon water level within each well and availability within the storage tanks. Influences from the pumping of the Bioreactor wells B3-EXW01 through B3-EXW05 are manifested as “cones of depression” in **Figure 2.1**. The Bioreactor cone of depression is induced into the aquifer to extract contaminated water within its direct zone of influence, and otherwise retard the flow of the groundwater that cannot be directly captured by the extraction wells away from the site.

CSSA drinking water wells CS-1, CS-10, and CS-12 are also cycled on and off to maintain the drinking water system currently in place at CSSA. The pumping effect of CS-12 is noted by the groundwater depression in the LGR potentiometric map (**Figure 2.1**). In June 2016, the cone of depressions between CS-12 and the Bioreactor has created a groundwater trough between the north and south ends of the facility. Groundwater from the North Pasture and the northern inner cantonment areas are pulled into this trough. In the central portion of CSSA, a westerly gradient is evident between the groundwater mound at CS-MW4-LGR and supply well CS-10. In the southern end of the base, the typical south-southeasterly groundwater gradient is evident.

Historical groundwater monitoring at CSSA has demonstrated that the aquifer gradient typically slopes in a south-southeast direction; however, variable aquifer levels and well-pumping scenarios can affect the localized and regional gradients (**Figure 2.1**). In particular, pumping action at wells CS-1, CS-10, CS-MW16-LGR/CC, B3-EXW01 through B3-EXW05, CS-MWH-LGR, CS-I, and even off-post wells (Fair Oaks Ranch) can significantly alter the LGR groundwater gradient. Normally, the regional gradient calculation, an overall groundwater gradient averaged across CSSA, is measured from CS-MWH-LGR to CS-MW21-LGR. However because of the groundwater trough between CS-12 and the Bioreactor, this typical flow is interrupted in June 2016. North Pasture groundwater from CS-MWH-LGR flows towards CS-12 at a gradient of 0.0087 ft/ft. Localized gradients of 0.0032 ft/ft to the west were measured between CS-MW4-LGR and CS-10. A strong south-southeasterly gradient of 0.038 ft/ft was present between CS-MW21-LGR and CS-1 at the southern end of the camp.

Under normal conditions, the potentiometric surface in both the BS and CC members of the aquifer generally trend in a southerly direction, like the LGR. But during periods of intense aquifer recharge, a strongly dominant eastward component in both the BS and CC is often observed (**Figures 2.2 and 2.3**). The BS potentiometric surface has a distinctly easterly gradient towards CS-MW1-BS (**Figure 2.2**), with an average groundwater elevation of 1,147.18 feet MSL. Likewise, the CC potentiometric surface has an easterly gradient with an average elevation of 1,141.41 feet MSL. In June 2016, the BS and CC potentiometric surface remarkably mimic the same potentiometric maps developed in June 2015, during the last period when average groundwater elevations were in excess of 1,100 feet MSL.

A review of historical data has shown that the CC potentiometric surface develops a predominantly easterly gradient when the average CC groundwater elevation is higher than 995 feet MSL. Below that elevation, the gradient resumes a more southerly direction. Notable for March 2016 is the lack of well-developed cone of depression around the Bioreactor extraction well, CS-MW16-CC. Normally this well is pumping during the quarterly groundwater level

measurement event, and results in an area-wide alteration of the natural groundwater gradient. In June 2016, the pump was not active during the measurement period, resulting in a potentiometric map that is indicative to the true groundwater gradient at the time.

Groundwater elevations have been measured and recorded since 1992. Previous droughts resulted in water levels decreasing substantially in 1996, 1999, 2000, 2006, 2008, 2009, 2011 through 2014. In 2015, approximately 44 inches of rainfall in the San Antonio area ended the drought cycle, resulting in a net gain of 145 feet in aquifer level over the course of the year. By June 2016, the postwide average level in the LGR wells increased by 110 feet from March 2016. With this increase, the June 2016 LGR groundwater average elevation (1166.20 feet MSL) is now 136 feet above the long-term (13.5 year) average groundwater elevation (1,029.74 feet MSL).

It is worth noting that, based on more than 13 years of program history, the postwide LGR groundwater level has declined by 115 feet (see **Figure 2.4**). As can be expected with sparse data sets, the largest rate of change/decline (90 feet) came during the initial 4 years of the groundwater monitoring program. Over the past 9 years, the average decline rate has subdued, losing an additional 30 feet of average groundwater elevation over 7 years of prolonged drought (with the exception of 2010). The past 13.5 year history of CSSA groundwater monitoring indicates that the aquifer level is “below average” approximately 67 percent of the time. However, the past five monitoring events (June, September, December 2015 and March, June 2016) have shown above-average aquifer levels. Above average groundwater elevations have been recorded only nine times in the past 27 monitoring events (6.75 years). Prior to June 2015, the LGR had not been above the long-term “average” water elevation since September 2010.



### 3.0 JUNE ANALYTICAL RESULTS

#### 3.1 Monitoring Wells

Under the provisions of the groundwater monitoring DQOs and the 2010 LTMO evaluation, the schedule for sampling on-post in June 2016 included five wells. The samples included three production wells (CS-1, CS-10, and CS-12), one future production well (CS-13), and one on-post monitoring well (see **Table 3.1**). In conjunction with the off-post monitoring initiative (under a separate report) the June 2016 groundwater sampling constituted a “quarterly” event in which selected wells are sampled every quarter.

All wells scheduled for monitoring in June 2016 were sampled. Additional samples were collected as part of the AOC-65 in-situ chemical oxidation (ISCO) Treatability Study; these results will be reported in a separate treatability study report. One additional monitoring well was added (CS-MW5-LGR) to further evaluate recent elevated volatile organic compounds (VOC) levels in this well. **Tables 3.1** and **3.2** provide a sampling overview for June 2016 and the schedule under the LTMO recommendations. The above-listed monitoring wells were sampled using a dedicated low-flow gas-operated bladder pump. Wells CS-1, CS-10, CS-12, and CS-13 were sampled using dedicated electric submersible pumps. **Figure 3.1** shows well sampling locations.

Wells sampled by low-flow pumps were purged until the field parameters of pH, temperature, and conductivity stabilized. The on-post monitoring wells were sampled in June 2016 for the short list of VOC and metals (chromium, cadmium, lead, and mercury). Active and future drinking water wells CS-1, CS-10, CS-12, and CS-13 were analyzed for the short list of VOCs and metals (arsenic, barium, chromium, copper, zinc, cadmium, mercury, and lead).

Samples were analyzed by Agriculture & Priority Pollutant Laboratories (APPL) in Clovis, California. All detected concentrations of VOCs and metals are presented in **Table 3.3**. Full analytical results are presented in **Appendix B**.

Trichloroethene (TCE) was detected above the Maximum Contaminant Level (MCL) of 5 micrograms per liter ( $\mu\text{g/L}$ ) in one on-post well sampled this quarter: CS-MW5-LGR. A comparison of VOC concentrations versus water level for select wells is presented in **Figure 3.2**. The overall trend for CS-MW36-LGR sampled in June 2016 was a decrease in VOC concentrations with an increase in groundwater elevation. CS-MW5-LGR has been sampled since 2001, but it has just recently (December 2015) shown concentrations of PCE and TCE above the MCL. In June TCE concentrations fell slightly but remained above the MCL while tetrachloroethene (PCE) fell slightly below the MCL. No metals were detected above the MCL/Action Level (AL)/Secondary Standard (SS) for wells sampled in June 2016.

In June 2016, trace detections (less than the Reporting Limit (RL) of PCE were reported in groundwater samples from supply wells CS-1, CS-10, and CS-13. To verify these results, each of these wells were re-sampled on July 21, 2016. The re-sampling effort did not indicate the presence of any VOC constituents in the drinking water wells.

Results from on-post monitoring wells are considered definitive data and are subject to data validation and verification under provisions of the CSSA Quality Assurance Project Plan (QAPP). Parsons data packages numbered 110046-#6 and -#12 containing the analytical results from this sampling event, were received by Parsons June 29 through July 7, 2016. Data validation was conducted and the data validation reports are presented in **Appendix C**.

**Table 3.1  
Overview of the On-Post Monitoring Program**

Count	Well ID	Analytes	Last Sample Date	Sep-15	Dec-15 (18 mo. snapshot)	Mar-16	Jun-16	Sampling Frequency *
	CS-MW1-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MW1-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW1-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW2-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MW2-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW3-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW4-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
added	CS-MW5-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-16	NS	S	S	S	Every 9 months
ISCO	CS-MW6-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW6-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW6-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
ISCO	CS-MW7-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW7-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
ISCO	CS-MW8-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MW8-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW9-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW9-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW9-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW10-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MW10-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW11A-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MW11B-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW12-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW12-BS	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-12	NS	NS	NS	NS	sampled on an as needed basis
	CS-MW12-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW16-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW16-CC	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CW-MW17-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW18-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW19-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
1	CS-1	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-16	S	S	S	S	Quarterly
	CS-2	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-4	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
2	CS-10	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-16	S	S	S	S	Quarterly
3	CS-12	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-16	S	S	S	S	Quarterly
4	CS-13	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Mar-16	S	S	S	S	Quarterly
	CS-D	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MWG-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MWH-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-I	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 18 months
	CS-MW20-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW21-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW22-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW23-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW24-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
	CS-MW25-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Every 9 months
	CS-MW35-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Dec-15	NS	S	NS	NS	Semi-annual + 9 month snapshot
5/ISCO	CS-MW36-LGR	VOCs & metals (Cr, Cd, Hg, Pb)	Mar-16	S	S	S	S	Quarterly

\* New LTMO sampling frequency implemented June 2011

S = Sample

NS = No Sample

NSWL = No Sample due to low water level

ISCO = well sampled as part of treatability study

Table 3.2 Westbay Sampling Frequency

Westbay Interval	Last Sample Date	Sep-15 (18 month)	Dec-15 (snapshot)	Mar-16	Jun-16 (9 month)	LTMO Sampling Frequency (as of June '11)	ISCO sample zones
CS-WB01-UGR-01	Dec-04	NSWL	NS	NS	S	Every 9 months	ISCO
CS-WB01-LGR-01	Sep-15	S	NS	NS	S	Every 9 months	ISCO
CS-WB01-LGR-02	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-03	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-04	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-05	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-06	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-07	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-08	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB01-LGR-09	Dec-15	S	S	NS	S	Every 9 months + snapshot	ISCO
CS-WB02-UGR-01	Dec-04	NSWL	NS	NS	NS	Every 9 months	ISCO
CS-WB02-LGR-01	Dec-14	NSWL	NS	NS	S	Every 9 months	ISCO
CS-WB02-LGR-02	Mar-10	NSWL	NS	NS	S	Every 9 months	
CS-WB02-LGR-03	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB02-LGR-04	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB02-LGR-05	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB02-LGR-06	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB02-LGR-07	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB02-LGR-08	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB02-LGR-09	Dec-15	S	S	NS	S	Every 9 months + snapshot	ISCO
CS-WB03-UGR-01	Sep-15	S	NS	NS	S	Every 9 months	ISCO
CS-WB03-LGR-01	Sep-15	S	NS	NS	S	Every 9 months	ISCO
CS-WB03-LGR-02	Oct-07	NSWL	NS	NS	S	Every 9 months	
CS-WB03-LGR-03	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB03-LGR-04	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB03-LGR-05	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB03-LGR-06	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB03-LGR-07	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB03-LGR-08	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB03-LGR-09	Dec-15	S	S	NS	S	Every 9 months + snapshot	ISCO
CS-WB04-UGR-01	Mar-04	NSWL	NS	NS	NS	Every 9 months	ISCO
CS-WB04-LGR-01	Sep-15	S	NS	NS	NS	Every 18 months	ISCO
CS-WB04-LGR-02	Mar-14	NSWL	NS	NS	NS	Every 18 months	
CS-WB04-LGR-03	Sep-15	S	NS	NS	NS	Every 18 months	
CS-WB04-LGR-04	Sep-15	S	NS	NS	NS	Every 18 months	
CS-WB04-LGR-06	Dec-15	S	S	NS	S	Every 9 months + snapshot	
CS-WB04-LGR-07	Dec-15	S	S	NS	S	Every 9 months + snapshot	
CS-WB04-LGR-08	Sep-15	S	NS	NS	S	Every 9 months	
CS-WB04-LGR-09	Dec-15	S	S	NS	S	Every 9 months + snapshot	
CS-WB04-LGR-10	Dec-15	S	S	NS	S	Every 9 months + snapshot	
CS-WB04-LGR-11	Dec-15	S	S	NS	S	Every 9 months + snapshot	ISCO
CS-WB04-BS-01	Sep-15	S	NS	NS	NS	Every 18 months	
CS-WB04-BS-02	Sep-15	S	NS	NS	NS	Every 18 months	
CS-WB04-CC-01	Sep-15	S	NS	NS	NS	Every 18 months	
CS-WB04-CC-02	Sep-15	S	NS	NS	NS	Every 18 months	
CS-WB04-CC-03	Sep-15	S	NS	NS	NS	Every 18 months	

Profiling performed quarterly, in conjunction with post wide water levels.



**Sampled Wells June 2016**

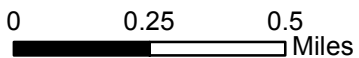
- > MCL (VOC's) only
- > RL (VOC's) only
- > MDL (VOC's) only
- ND

**Figure 3.1**

On-Post and Off-Post Well Sampling Locations for June 2016

Camp Stanley Storage Activity

**PARSONS**



**Table 3.3**  
**June 2016 On-Post Quarterly Groundwater Results, Detected Analytes**

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CS-MW5-LGR	6/7/2016	NA	NA	--	--	NA	--	NA	--
CS-MW36-LGR	6/7/2016	NA	NA	--	<b>0.0036F</b>	NA	--	NA	--
CSSA Drinking Water Well System									
CS-1	6/17/2016	<b>0.0078F</b>	<b>0.0395</b>	--	<b>0.0016F</b>	<b>0.014</b>	<b>0.0068F</b>	<b>0.284</b>	--
CS-10	6/17/2016	<b>0.0060F</b>	<b>0.0403</b>	--	<b>0.0014F</b>	<b>0.005F</b>	<b>0.0050F</b>	<b>0.357</b>	--
CS-12	6/17/2016	<b>0.0070F</b>	<b>0.0314</b>	--	<b>0.0016F</b>	<b>0.035</b>	<b>0.0096F</b>	<b>0.104</b>	--
CS-13	6/20/2016	<b>0.0028F</b>	<b>0.0308</b>	--	<b>0.0017F</b>	--	--	<b>0.276</b>	--
Comparison Criteria									
<b>Method Detection Limit (MDL)</b>		<b>0.00022</b>	<b>0.0003</b>	<b>0.0005</b>	<b>0.001</b>	<b>0.003</b>	<b>0.0019</b>	<b>0.008</b>	<b>0.0001</b>
<b>Reporting Limit (RL)</b>		<b>0.03</b>	<b>0.005</b>	<b>0.007</b>	<b>0.01</b>	<b>0.01</b>	<b>0.025</b>	<b>0.05</b>	<b>0.001</b>
<b>Max. Contaminant Level (MCL)</b>		<b>0.01</b>	<b>2</b>	<b>0.005</b>	<b>0.1</b>	<b>AL=1.3</b>	<b>AL=0.015</b>	<b>SS=5.0</b>	<b>0.002</b>

Well ID	Sample Date	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	Vinyl Chloride
CS-MW5-LGR	6/7/2016	--	<b>10.5</b>	--	<b>4.18</b>	<b>10.96</b>	--
CS-MW36-LGR	6/7/2016	--	--	--	<b>4.12</b>	<b>1.53</b>	--
CSSA Drinking Water Well System							
CS-1	6/17/2016	--	--	--	<b>0.27F</b>	--	--
CS-1	7/21/2016	--	--	--	--	--	--
CS-10	6/17/2016	--	--	--	<b>0.16F</b>	--	--
CS-10	7/21/2016	--	--	--	--	--	--
CS-12	6/17/2016	--	--	--	<b>0.35F</b>	--	--
CS-12	7/21/2016	--	--	--	--	--	--
CS-12 FD	7/21/2016	--	--	--	--	--	--
CS-13	6/20/2016	--	--	--	--	--	--
Comparison Criteria							
<b>Method Detection Limit (MDL)</b>		<b>0.12</b>	<b>0.07</b>	<b>0.08</b>	<b>0.06</b>	<b>0.05</b>	<b>0.08</b>
<b>Reporting Limit (RL)</b>		<b>1.2</b>	<b>1.2</b>	<b>0.6</b>	<b>1.4</b>	<b>1</b>	<b>1.1</b>
<b>Max. Contaminant Level (MCL)</b>		<b>7</b>	<b>70</b>	<b>100</b>	<b>5</b>	<b>5</b>	<b>2</b>

<b>BOLD</b>	≥ MDL
<b>BOLD</b>	≥ RL
<b>BOLD</b>	≥ MCL

Precipitation per Quarter:	Mar-16	Jun-16
AOC-65 Weather Station (AOC-65 WS)	2.99	19.39
B-3 Weather Station (B-3 WS)	4.68	NA

All samples were analyzed by APPL, Inc.

VOC data reported in ug/L & metals data reported in mg/L.

**Abbreviations/Notes:**

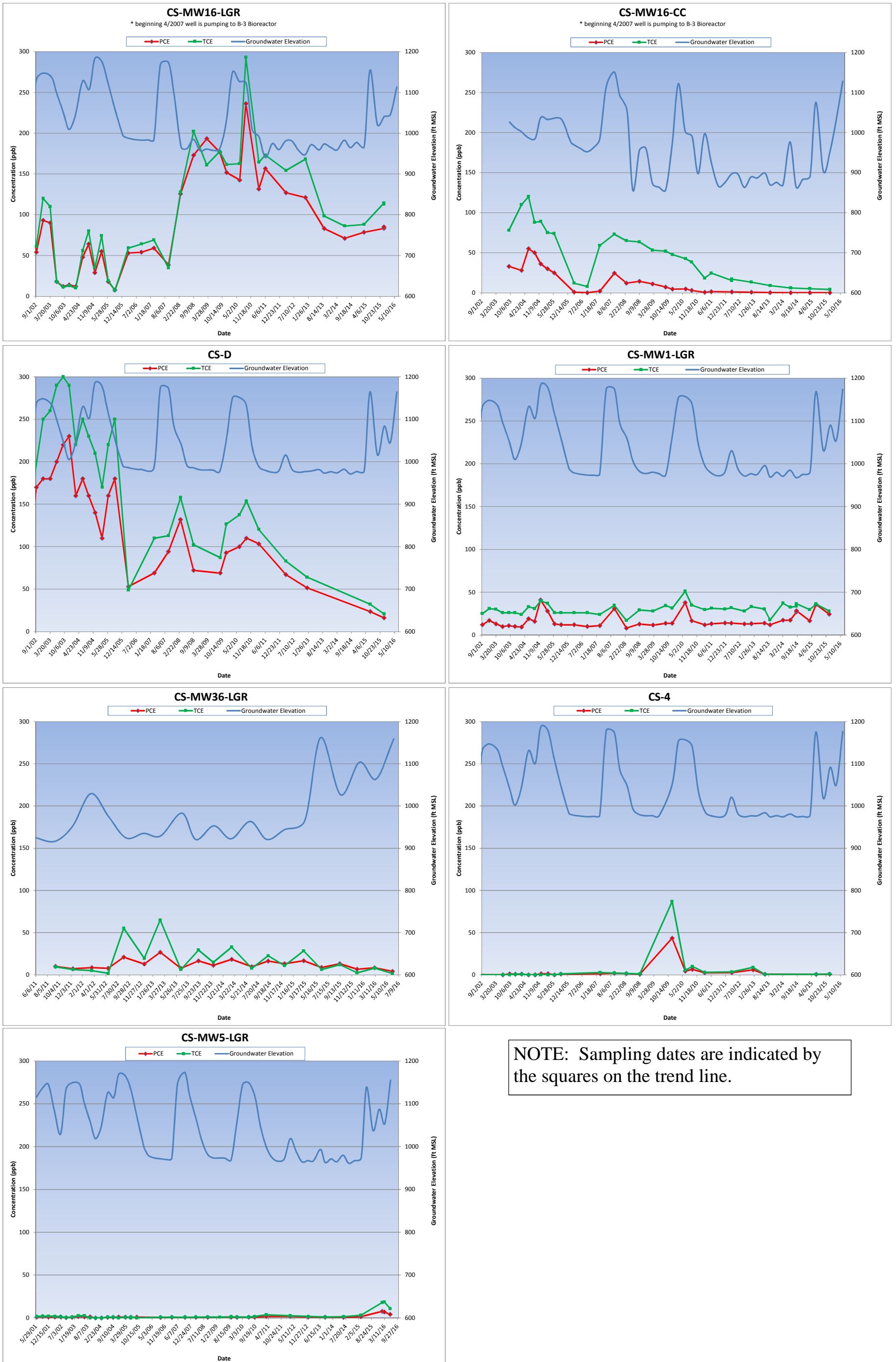
- FD Field Duplicate
- TCE Trichloroethene
- PCE Tetrachloroethene
- DCE Dichloroethene
- AL Action Level
- SS Secondary Standard
- NA Not Analyzed for this parameter

**Data Qualifiers:**

--The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.

F-The analyte was positively identified but the associated numerical value is below the RL.

**Figure 3.2**  
**On-Post Cumulative VOC Concentrations vs. Groundwater Elevation**



**NOTE: Sampling dates are indicated by the squares on the trend line.**

### 3.2 Westbay-equipped Wells

Under the provisions of the groundwater monitoring LTMO recommendations, 37 zones on the 9-month schedule (**Table 3.2**) at AOC-65 Westbay wells (CS-WB01, CS-WB02, CS-WB03, and CS-WB04) were scheduled for sampling in June 2016. These wells were also profiled to capture water level readings. These Westbay wells are located in the vicinity of AOC-65, and are part of the post-wide quarterly groundwater monitoring program. The Upper Glen Rose (UGR)/LGR zones are sampled on a 9-month schedule; the BS/CC zones are sampled on an 18-month schedule; and LTMO selected zones are sampled with the snapshot event, as recommended in the LTMO. The sampling of these wells began in September 2003.

Of the 37 zones scheduled for sampling in June 2016, 35 samples were obtained. Two zones were not collected. CS-WB04-UGR-01 was dry and the sample port to CS-WB02-UGR-01 is clogged with silt. (**Table 3.4**). A total of 34 zones had detections of either *cis*-1,2-DCE, PCE, or TCE above their respective RL. Fifteen of those zones were also in excess of the MCLs for either PCE and/or TCE. Six of these zones also had low detections of *trans*-1,2-Dichloroethene (*trans*-1,2-DCE reported at concentrations less than 1 µg/L. A trace detection of vinyl chloride was reported in zone CS-WB03.

All zones in CS-WB01 were sampled in June 2016. The uppermost zone CS-WB01-UGR-01, typically dry, has not been sampled since December 2004. This zone showed a trace detection of PCE. Zone –LGR-03 reported its highest detection to date for both PCE and TCE. Zone –LGR-05 had concentrations of TCE above the RL for the first time since it was first sampled in September 2003. Zone –LGR-06 had peak concentrations of TCE and *cis*-1,2-DCE and zone –LGR-08 also reported a peak concentration of *cis*-1,2-DCE.

All but the upper –UGR zone was sampled in CS-WB02 in June 2016. This upper zone has been filled with silt and the sampling port is clogged. Zone –LGR-05 showed its second and highest detection of *cis*-1,2-DCE. Zones –LGR-04, –LGR-06 and –LGR-09 has concentration of PCE and/or TCE above the MCL.

All zones in CS-WB03 were sampled in June 2016. Overall the PCE and TCE concentrations are decreased in this well. Zone –LGR-02 has been dry since October 2007, but this zone had PCE above the MCL in June 2016. Zone –LGR-06 reported its highest concentration of *cis*-1,2-DCE to date, (still below the MCL). Zone –LGR-07 also reported a significant increase in PCE and TCE, both above the MCL. Zone –LGR-08 had its third and highest detection of vinyl chloride to date.

Six of the seven zones scheduled for sampling in CS-WB04 were collected in June 2016. The upper zone –UGR-01 was dry. Zone –LGR-07 showed a significant decrease in PCE and TCE with a slight increase in *cis*-1,2-DCE. Zone –LGR-11 was above the MCL for PCE in December 2015, but was non-detect in June 2016.

There are four other Westbay wells (CS-WB05, CS-WB06, CS-WB07, and CS-WB08) that are located at the SWMU B-3 remediation site. Those wells are sampled on a separate schedule in association with the SWMU B-3 bioreactor monitoring. Results for those wells are presented in the SWMU B-3 Performance Status Reports.

**Table 3.4**  
**June 2016 Westbay Quarterly Results, Detected Analytes**

Well ID	Date Sampled	1,1-DCE (1,1-dichloroethene)	cis-1,2-DCE (cis-1,2-dichloroethene)	TCE (trichloroethene)	PCE (tetrachloroethene)	trans-1,2-DCE (trans-1,2-dichloroethene)	Vinyl Chloride
CS-WB01-UGR-01	6/8/2016	--	--	--	0.99F	--	--
CS-WB01-LGR-01	6/8/2016	--	--	0.22F	1.36F	--	--
CS-WB01-LGR-02	6/8/2016	--	--	2.05	9.6	--	--
CS-WB01-LGR-03	6/8/2016	--	--	19.59	7.06	--	--
CS-WB01-LGR-04	6/8/2016	--	0.28F	--	--	--	--
CS-WB01-LGR-05	6/8/2016	--	0.41F	2.6	--	--	--
CS-WB01-LGR-06	6/8/2016	--	1.58	3.03	--	--	--
CS-WB01-LGR-07	6/8/2016	--	0.29F	13.78	14.3	--	--
CS-WB01-LGR-08	6/8/2016	--	18.31	4.59	0.79F	0.76	--
CS-WB01-LGR-09	6/8/2016	--	0.69F	12.56	9.55	--	--
CS-WB02-LGR-01	6/14/2016	--	--	--	0.59F	--	--
CS-WB02-LGR-02	6/14/2016	--	--	--	0.22F	--	--
CS-WB02-LGR-03	6/14/2016	--	--	0.47F	3.28	--	--
CS-WB02-LGR-04	6/14/2016	--	--	5.03	2.86	--	--
CS-WB02-LGR-05	6/14/2016	--	0.23F	1.92	0.66F	0.25F	--
CS-WB02-LGR-06	6/14/2016	--	--	2.27	5.38	--	--
CS-WB02-LGR-07	6/14/2016	--	0.31F	1.57	0.52F	--	--
CS-WB02-LGR-08	6/14/2016	--	3.1	0.28F	--	0.36F	--
CS-WB02-LGR-09	6/14/2016	--	--	7.42	7.31	--	--
CS-WB03-UGR-01	6/16/2016	--	7.94	73.39	7443.88***	0.95	--
CS-WB03-LGR-01	6/16/2016	--	0.89F	17.22	314.33**	--	--
CS-WB03-LGR-02	6/16/2016	--	--	4.7	146.66*	--	--
CS-WB03-LGR-03	6/16/2016	--	--	1.13	3.79	--	--
CS-WB03-LGR-04	6/16/2016	--	0.25F	6.59	17.97	--	--
CS-WB03-LGR-05	6/15/2016	--	--	2.48	14.1	--	--
CS-WB03-LGR-06	6/15/2016	--	6.83	0.13F	--	--	--
CS-WB03-LGR-07	6/15/2016	--	3.09	21.75	6.22	--	--
CS-WB03-LGR-08	6/15/2016	--	2.73	0.27F	--	--	0.81F
CS-WB03-LGR-09	6/15/2016	--	--	2.69	1.94	--	--
CS-WB04-LGR-06	6/9/2016	--	3.83	13.37	13.96	0.24F	--
CS-WB04-LGR-07	6/9/2016	--	37.11	1.15	--	0.23F	--
CS-WB04-LGR-08	6/9/2016	--	--	0.86F	0.51F	--	--
CS-WB04-LGR-09	6/9/2016	--	--	6.02	7.6	--	--
CS-WB04-LGR-10	6/9/2016	--	--	0.73F	1.71	--	--
CS-WB04-LGR-11	6/9/2016	--	--	--	--	--	--
Comparison Criteria							
Method Detection Limit	<b>MDL</b>	0.12	0.07	0.05	0.06	0.08	0.08
Reporting Limit	<b>RL</b>	1.2	1.2	1	1.4	0.6	1.1
Max. Contaminant Level	<b>MCL</b>	7	70	5	5	100	2

**Data Qualifiers**

'--' indicates the result was non-detect.

F-The analyte was positively identified but the associated numerical value is below the RL.

\* dilution of 2 run for this sample.

\*\* dilution of 5 run for this sample.

\*\*\* dilution of 200 run for this sample.

All values are reported in µg/L.

<b>BOLD</b>	≥ MDL
<b>BOLD</b>	≥ RL
<b>BOLD</b>	≥ MCL



#### 4.0 JUNE 2016 SUMMARY

- Groundwater samples were collected from all 5 of the on-post wells scheduled for monitoring in June 2016. One well (CS-MW5-LGR) was added to the schedule to monitor recent rising VOC levels in the well.
- From March 17 to June 22, 2016, CSSA's AOC-65 weather station recorded 19.39 inches of rain. The rainfall was consistent with 9 inches falling in April and 8.5 inches falling in May. Six events had greater than one inch of rain and 3 of those events had greater than 2 inches of rain. The SWMU B-3 weather station malfunctioned during this time period and did not record a complete set of data. The B-3 WS has since been repaired and back online as of May 31, 2016.
- The Middle Trinity aquifer levels (LGR, BS, and CC) increased an average of 106.82 feet per non-pumping wells since last quarter. The average water level in June 2016 (excluding pumping wells) was 81.92 feet BTOC (1159.63 feet MSL).
- VOCs were detected above the MCL in well CS-MW5-LGR. The VOC levels in this well showed a moderate decrease from the previous sampling event (see **Figure 3.2**). This is the third sampling event CS-MW5-LGR VOC levels have been above the MCL. This well has been sampled since 2001.
- Three drinking water wells (CS-1, CS-10, and CS-12) showed trace detections, below the RL, of PCE in June 2016. These wells were re-sampled in July where no VOCs were detected.
- There were no metals detected above the MCL/AL/SS in wells sampled in June 2016.
- Of the 37 zones scheduled for sampling in June 2016, 35 samples were obtained. Two zones were not collected. CS-WB04-UGR-01 was dry and the sample port to CS-WB02-UGR-01 is clogged with silt. (**Table 3.4**). A total of 34 zones had detections of either *cis*-1,2-DCE, PCE, or TCE above their respective reporting limits (RL). Fifteen of those zones were also in excess of the MCLs for either PCE and/or TCE. Six of these zones also had low detections of *trans*-1,2-DCE reported at concentrations less than 1 µg/L. A trace detection of vinyl chloride was reported in zone CS-WB03.
- The updated groundwater project DQOs and LTMO have been approved by the TCEQ April 22, 2016 and EPA May 5, 2016. The new DQOs and LTMO will be implemented during the September 2016 groundwater event. Changes will include modifications in the sample collection frequency and analytical parameters in selected wells.

**APPENDIX A**

**EVALUATION OF DATA QUALITY OBJECTIVES ATTAINMENT**

**Appendix A Evaluation of Data Quality Objectives Attainment**

Activity	Objectives	Action	Objective Attained?	Recommendations
Field Sampling	Conduct field sampling in accordance with procedures defined in the project work plan, SAP, QAPP, HSP, and LTMO recommendations.	All sampling was conducted in accordance with the procedures described in the project plans.	Yes.	NA
Characterization of Environmental Setting (Hydrogeology)	Prepare water-level contour and/or potentiometric maps for each formation of the Middle Trinity Aquifer (3.5.3).	Potentiometric surface maps were prepared based on water levels measured in each of CSSA's wells screened in three formations on June 13, 2016.	To the extent possible with data available. Due to the limited data available and the fact that wells are completed across multiple water-bearing units, potentiometric maps should only be used for regional water flow direction, not local. Ongoing pumping in the CSSA area likely affects the natural groundwater flow direction.	As additional wells are installed screened in distinct formations, future evaluations will eliminate reliance on wells screened across multiple formations.
	Describe the flow system, including the vertical and horizontal components of flow (2.1.9).	Potentiometric maps were created using June 13, 2016 water level data, and horizontal flow direction was tentatively identified. Insufficient data are currently available to determine vertical component of flow.	As described above, due to the lack of aquifer-specific water level information, potentiometric surface maps should only be used as an estimate of regional flow direction.	Same as above.
	Define formation(s) in the Middle Trinity Aquifer are impacted by the VOC contaminants (2.1.3).	Quarterly groundwater monitoring provides information on Middle Trinity Aquifer impacts. Monitoring wells equipped with Westbay® - multi-port samplers are sampled every 9 or 18 months and 8 selected zones are sampled during the 'snapshot' event.	Yes.	Continue sampling.

Activity	Objectives	Action	Objective Attained?	Recommendations
Characterization of Environmental Setting (Hydrogeology) (Continued)	Identify any temporal changes in hydraulic gradients due to seasonal influences (2.1.5).	Downloaded data from continuous-reading transducers in wells: CS-MW4-LGR, CS-MW9-LGR, CS-MW12-LGR, CS-MW12-CC, CS-MW10-CC and CS-MW24-LGR. Additional continuous reading transducers were added to the program through the SCADA project. The following wells can be uploaded to see real time water level data: CS-MW16-LGR, CS-MW16-CC, CS-1, CS-12, and CS-10. Data was also downloaded from the AOC-65 and B-3 weather stations. Water levels will be graphed at these wells against precipitation data through December 2016 and included in the annual groundwater report.	Yes.	Continue collection of transducer data and possibly install transducers in other cluster wells.
Contamination Characterization (Ground Water Contamination)	Characterize the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Facility (3.1.2).	Samples for laboratory analysis were collected from 6 of 49 CSSA wells. The 4 BS wells are no longer sampled as part of the groundwater program.	The horizontal and vertical extent of groundwater contamination is continuously monitored.	Continue groundwater monitoring and construct additional wells as necessary.
	Determine the horizontal and vertical concentration profiles of all constituents of concern (COC) in the groundwater that are measured by USEPA-approved procedures (3.1.2). COCs are those chemicals that have been detected in groundwater in the past and their daughter (breakdown) products.	Groundwater samples were collected from wells: CS-MW5-LGR and CS-MW36-LGR. Samples were analyzed for the short list of VOCs using USEPA method SW8260B, and metals (cadmium, lead, mercury, and chromium). The drinking water wells (CS-1, CS-10, CS-12 and CS-13) were sampled for the short list of VOCs and additional metals (arsenic, barium, copper, and zinc). Analyses were conducted in accordance with the CSSA QAPP and approved variances. All reporting limits (RL) were below MCLs, as listed below:	Yes.	Continue sampling.

Activity	Objectives	Action			Objective Attained?	Recommendations
Contamination Characterization (Ground Water Contamination) (Continued)	Determine the horizontal and vertical concentration profiles of all constituents of concern (COC) in the groundwater that are measured by USEPA-approved procedures (3.1.2). COCs are those chemicals that have been detected in groundwater in the past and their daughter (breakdown) products.	<b>ANALYTE</b>	<b>RL (µg /L)</b>	<b>MCL(µg/L)</b>	Yes.	Continue sampling.
		1,1-DCE	1.2	7		
	<i>cis</i> -1,2-DCE	1.2	70	Yes.	Continue sampling.	
	<i>trans</i> -1,2-DCE	0.6	100			
		PCE	1.4	5		
		TCE	1.0	5		
		Vinyl chloride	1.1	2		
		<b>ANALYTE</b>	<b>RL (µg/L)</b>	<b>MCL/AL (µg /L)</b>	Yes.	Continue sampling.
		Barium	5	2,000		
		Chromium	10	100		
		Copper	10	1,300		
		Zinc	50	5,000		
		Arsenic	30	10		
		Cadmium	7	5		
		Lead	25	15		
		Mercury	1	2		
	Meet CSSA QAPP quality assurance requirements.	Samples were analyzed in accordance with the CSSA QAPP and approved variances. Parsons chemists verified all data.			Yes.	NA
		All data flagged with a "U," "J," "M," and "F" are usable for characterizing contamination. All "R" flagged data are considered unusable.			Yes.	NA

Activity	Objectives	Action	Objective Attained?	Recommendations
Contamination Characterization (Ground Water Contamination) (Continued)	Meet CSSA QAPP quality assurance requirements. (Continued)	Previously, a method detection limit (MDL) study for arsenic, cadmium, and lead was not performed within a year of the analyses, as required by the AFCEE QAPP.	The laboratory performed new MDL studies in February 2001 for these metals and the new MDL values were found to be almost identical to the previous MDLs and all met the associated AFCEE QAPP requirements. MDLs for these three metals are well below MCLs. In addition, the laboratory performed daily calibrations and RL verifications for these metals, both of which demonstrate the laboratory's ability to detect and quantitate these metals at RL levels. These daily analyses also indicate that concentrations above the laboratory RL for these compounds were not affected by the expired MDL study.	Use results for groundwater characterization purposes.
Remediation	Determine goals and create cost-effective and technologically appropriate methods for remediation (2.2.1).	Continued data collection will provide analytical results for accomplishing this objective.	Ongoing.	Continue sampling and evaluation, including quarterly groundwater monitoring teleconferences to address remediation.
	Determine placement of new wells for monitoring (2.3.1, 3.6)	Sampling frequency and sample locations to be monitored (including any new wells) will be based on trend data from monitoring event(s) (3.1.5).	Ongoing.	Continue quarterly groundwater teleconferences to discuss sampling frequency and placement of new monitor wells.
Project schedule/ Reporting	Produce a quarterly monitoring project schedule as a road map for sampling, analysis, validation, verification, reviews, and reports.	Prepare schedules and sampling guidelines prior to each quarterly sampling event.	Yes.	Continue sampling schedule preparation each quarter.

**APPENDIX B**

**QUARTERLY ON-POST GROUNDWATER  
MONITORING ANALYTICAL RESULTS  
MARCH 2016**

**Appendix B**  
**Quarterly On-Post Groundwater Monitoring Analytical Results, June 2016**

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CS-MW5-LGR	6/7/2016	NA	NA	0.0005U	0.0010U	NA	0.0019U	NA	0.0001U
CS-MW36-LGR	6/7/2016	NA	NA	0.0005U	<b>0.0036F</b>	NA	0.0019U	NA	0.0001U
CSSA Drinking Water Well System									
CS-1	6/17/2016	<b>0.0078F</b>	<b>0.0395</b>	0.0005U	<b>0.0016F</b>	<b>0.014</b>	<b>0.0068F</b>	<b>0.284</b>	0.0001U
CS-10	6/17/2016	<b>0.0060F</b>	<b>0.0403</b>	0.0005U	<b>0.0014F</b>	<b>0.005F</b>	<b>0.0050F</b>	<b>0.357</b>	0.0001U
CS-12	6/17/2016	<b>0.0070F</b>	<b>0.0314</b>	0.0005U	<b>0.0016F</b>	<b>0.035</b>	<b>0.0096F</b>	<b>0.104</b>	0.0001U
CS-13	6/20/2016	<b>0.0028F</b>	<b>0.0308</b>	0.0005U	<b>0.0017F</b>	0.003U	0.0019U	<b>0.276</b>	0.0001U

Well ID	Sample Date	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	Vinyl Chloride
CS-MW5-LGR	6/7/2016	0.12U	<b>10.5</b>	0.08U	<b>4.18</b>	<b>10.96</b>	0.08U
CS-MW36-LGR	6/7/2016	0.12U	0.07U	0.08U	<b>4.12</b>	<b>1.53</b>	0.08U
CSSA Drinking Water Well System							
CS-1	6/17/2016	0.12U	0.07U	0.08U	<b>0.27F</b>	0.05U	0.08U
CS-1	7/21/2016	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-10	6/17/2016	0.12U	0.07U	0.08U	<b>0.16F</b>	0.05U	0.08U
CS-10	7/21/2016	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-12	6/17/2016	0.12U	0.07U	0.08U	<b>0.35F</b>	0.05U	0.08U
CS-12	7/21/2016	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-12 FD	7/21/2016	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U
CS-13	6/20/2016	0.12U	0.07U	0.08U	0.06U	0.05U	0.08U

<b>BOLD</b>	≥ MDL
<b>BOLD</b>	≥ RL
<b>BOLD</b>	≥ MCL

All samples were analyzed by APPL, Inc.  
VOC data reported in ug/L & metals data reported in mg/L.  
**Abbreviations/Notes:**  
FD                    Field Duplicate  
TCE                  Trichloroethene  
PCE                  Tetrachloroethene  
DCE                  Dichloroethene  
AL                    Action Level  
SS                    Secondary Standard  
NA                    Not Analyzed for this parameter  
**Data Qualifiers:**  
U-The analyte was analyzed for, but not detected. The associated numerical value is at or below the  
F-The analyte was positively identified but the associated numerical value is below the RL.



## **APPENDIX C**

### **Westbay Well Analytical Results, June 2016**

**Appendix C**  
**Westbay Well Analytical Results, June 2016**

Well ID	Date Sampled	1,1-DCE (1,1-dichloroethene)	cis-1,2-DCE (cis-1,2-dichloroethene)	TCE (trichloroethene)	PCE (tetrachloroethene)	trans-1,2-DCE (trans-1,2-dichloroethene)	Vinyl Chloride
CS-WB01-UGR-01	6/8/2016	<0.12	<0.07	<0.05	<b>0.99F</b>	<0.08	<0.08
CS-WB01-LGR-01	6/8/2016	<0.12	<0.07	<b>0.22F</b>	<b>1.36F</b>	<0.08	<0.08
CS-WB01-LGR-02	6/8/2016	<0.12	<0.07	<b>2.05</b>	<b>9.6</b>	<0.08	<0.08
CS-WB01-LGR-03	6/8/2016	<0.12	<0.07	<b>19.59</b>	<b>7.06</b>	<0.08	<0.08
CS-WB01-LGR-04	6/8/2016	<0.12	<b>0.28F</b>	<0.05	<0.06	<0.08	<0.08
CS-WB01-LGR-05	6/8/2016	<0.12	<b>0.41F</b>	<b>2.6</b>	<0.06	<0.08	<0.08
CS-WB01-LGR-06	6/8/2016	<0.12	<b>1.58</b>	<b>3.03</b>	<0.06	<0.08	<0.08
CS-WB01-LGR-07	6/8/2016	<0.12	<b>0.29F</b>	<b>13.78</b>	<b>14.3</b>	<0.08	<0.08
CS-WB01-LGR-08	6/8/2016	<0.12	<b>18.31</b>	<b>4.59</b>	<b>0.79F</b>	<b>0.76</b>	<0.08
CS-WB01-LGR-09	6/8/2016	<0.12	<b>0.69F</b>	<b>12.56</b>	<b>9.55</b>	<0.08	<0.08
CS-WB02-LGR-01	6/14/2016	<0.12	<0.07	<0.05	<b>0.59F</b>	<0.08	<0.08
CS-WB02-LGR-02	6/14/2016	<0.12	<0.07	<0.05	<b>0.22F</b>	<0.08	<0.08
CS-WB02-LGR-03	6/14/2016	<0.12	<0.07	<b>0.47F</b>	<b>3.28</b>	<0.08	<0.08
CS-WB02-LGR-04	6/14/2016	<0.12	<0.07	<b>5.03</b>	<b>2.86</b>	<0.08	<0.08
CS-WB02-LGR-05	6/14/2016	<0.12	<b>0.23F</b>	<b>1.92</b>	<b>0.66F</b>	<b>0.25F</b>	<0.08
CS-WB02-LGR-06	6/14/2016	<0.12	<0.07	<b>2.27</b>	<b>5.38</b>	<0.08	<0.08
CS-WB02-LGR-07	6/14/2016	<0.12	<b>0.31F</b>	<b>1.57</b>	<b>0.52F</b>	<0.08	<0.08
CS-WB02-LGR-08	6/14/2016	<0.12	<b>3.1</b>	<b>0.28F</b>	<0.06	<b>0.36F</b>	<0.08
CS-WB02-LGR-09	6/14/2016	<0.12	<0.07	<b>7.42</b>	<b>7.31</b>	<0.08	<0.08
CS-WB03-UGR-01	6/16/2016	<0.12	<b>7.94</b>	<b>73.39</b>	<b>7443.88***</b>	<b>0.95</b>	<0.08
CS-WB03-LGR-01	6/16/2016	<0.12	<b>0.89F</b>	<b>17.22</b>	<b>314.33**</b>	<0.08	<0.08
CS-WB03-LGR-02	6/16/2016	<0.12	<0.07	<b>4.7</b>	<b>146.66*</b>	<0.08	<0.08
CS-WB03-LGR-03	6/16/2016	<0.12	<0.07	<b>1.13</b>	<b>3.79</b>	<0.08	<0.08
CS-WB03-LGR-04	6/16/2016	<0.12	<b>0.25F</b>	<b>6.59</b>	<b>17.97</b>	<0.08	<0.08
CS-WB03-LGR-05	6/15/2016	<0.12	<0.07	<b>2.48</b>	<b>14.1</b>	<0.08	<0.08
CS-WB03-LGR-06	6/15/2016	<0.12	<b>6.83</b>	<b>0.13F</b>	<0.06	<0.08	<0.08
CS-WB03-LGR-07	6/15/2016	<0.12	<b>3.09</b>	<b>21.75</b>	<b>6.22</b>	<0.08	<0.08
CS-WB03-LGR-08	6/15/2016	<0.12	<b>2.73</b>	<b>0.27F</b>	<0.06	<0.08	<b>0.81F</b>
CS-WB03-LGR-09	6/15/2016	<0.12	<0.07	<b>2.69</b>	<b>1.94</b>	<0.08	<0.08
CS-WB04-LGR-06	6/9/2016	<0.12	<b>3.83</b>	<b>13.37</b>	<b>13.96</b>	<b>0.24F</b>	<0.08
CS-WB04-LGR-07	6/9/2016	<0.12	<b>37.11</b>	<b>1.15</b>	<0.06	<b>0.23F</b>	<0.08
CS-WB04-LGR-08	6/9/2016	<0.12	<0.07	<b>0.86F</b>	<b>0.51F</b>	<0.08	<0.08
CS-WB04-LGR-09	6/9/2016	<0.12	<0.07	<b>6.02</b>	<b>7.6</b>	<0.08	<0.08
CS-WB04-LGR-10	6/9/2016	<0.12	<0.07	<b>0.73F</b>	<b>1.71</b>	<0.08	<0.08
CS-WB04-LGR-11	6/9/2016	<0.12	<0.07	<0.05	<0.06	<0.08	<0.08

**Data Qualifiers**

F-The analyte was positively identified but the associated numerical value is below the RL.

\* The analyte was run at a dilution of 2.

\*\* The analyte was run at a dilution of 5.

\*\*\* The analyte was run at a dilution of 200.

All values are reported in µg/L.

<b>BOLD</b>	≥ MDL
<b>BOLD</b>	≥ RL
<b>BOLD</b>	≥ MCL

**APPENDIX D**  
**DATA VALIDATION REPORT**

**SDG 80090**  
**SDG 80174**

**DATA VERIFICATION SUMMARY REPORT**  
**for on-post samples collected from**  
**CAMP STANLEY STORAGE ACTIVITY**

**BOERNE, TEXAS**

Data Verification by: Tammy Chang  
Parsons - Austin

**INTRODUCTION**

The following data verification summary report covers two groundwater samples and the associated field quality control (QC) sample collected from on-post Camp Stanley Storage Activity (CSSA) on June 7, 2016. The samples were assigned to the following Sample Delivery Group (SDG). All samples were analyzed for volatile organic compounds (VOCs) and metals including cadmium, chromium, lead, and mercury.

80090

The field QC samples associated with this SDG was one trip blank (TB). TB was analyzed for VOC only. No ambient blanks were collected. During the initiation of this project, it was determined that ambient blanks were not necessary due to the absence of a source at these sites.

All samples were collected by Parsons and analyzed by APPL, Inc. following the procedures outlined in the Statement of Work and CSSA QAPP, Version 1.0. Samples in this SDG were shipped to the laboratory in one cooler. The cooler was received by the laboratory at a temperature of 3.0 °C, which was within the 2-6°C range recommended by the CSSA QAPP.

**EVALUATION CRITERIA**

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the CSSA QAPP, Version 1.0. Information reviewed in the data package included sample results; field and laboratory quality control samples; calibrations; case narratives; raw data; chain-of-custody (COC) forms and the sample receipt checklist. The findings presented in this report are based on the reviewed information, and whether the guidelines in the CSSA QAPP, Version 1.0, were met.

## **VOLATILES**

### **General**

The volatiles portion of this data package consisted of two (2) on-post groundwater samples and one (1) TB. All samples were collected from June 7, 2016 and analyzed for a reduced list of VOCs which included: 1,1-dichloroethene, *cis*-1,2-dichloroethene, tetrachloroethene, *trans*-1,2-dichloroethene, trichloroethene, and vinyl chloride.

The VOC analyses were performed using United States Environmental Protection Agency (USEPA) SW846 Method 8260B. The samples were analyzed in one analytical batch #208548 under one set of initial calibration (ICAL). All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method. All analyses were performed undiluted.

### **Accuracy**

Accuracy was evaluated using the percent recovery (%R) obtained from the laboratory control spike (LCS) sample and the surrogate spikes.

All LCS and surrogate spike recoveries were within acceptance criteria.

### **Precision**

Precision could not be evaluated due to lack of duplicate analyses involved in this SDG.

### **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining trip and laboratory blanks for cross contamination of samples during transit or analysis.

All samples in this data package were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0. All samples were prepared and analyzed within the holding time required by the method.

- All instrument performance check criteria were met.
- All initial calibration criteria were met.
- All initial calibration verification (ICV) criteria were met. The ICV was prepared using a secondary source standard. All second source verification criteria were met.
- All continuing calibration verification (CCV) criteria were met.

- All internal standard criteria were met.

There were one method blank and one TB associated with the VOC analyses in this SDG. All blanks were non-detect at method detection limits for all target VOCs.

### **Completeness**

Completeness has been evaluated in accordance with the CSSA QAPP. The number of usable results has been divided by the number of possible individual analyte results and expressed as a percentage to determine the completeness of the data set.

All VOC results for the two samples in this SDG were considered usable. The completeness for this SDG is 100%, which meets the minimum acceptance criteria of 95%.

## **ICP-AES METALS**

### **General**

The ICP-AES portion of this SDG consisted of two (2) on-post groundwater samples. Both samples were collected on June 7, 2016 and analyzed for cadmium, chromium, and lead.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method.

The samples for ICP-AES metals were digested in batch #209037. All analyses were performed undiluted.

### **Accuracy**

Accuracy was evaluated using the percent recovery obtained from the LCS.

The LCS recoveries were within acceptance criteria.

### **Precision**

Precision could not be measured due to lack of duplicate analyses involved in this SDG.

### **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating preservation and holding times; and
- Examining laboratory blank for cross contamination of samples during analysis.

Both samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0, prepared and analyzed within the holding time required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All CCV criteria were met.
- All interference check (ICSA/ICSAB) criteria were met.
- No dilution test was required, as per the CSSA QAPP.

One method blank and several calibration blanks were analyzed in association with the ICP-AES analyses in this SDG. All blanks were free of target metals at or above the RL.

### **Completeness**

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All ICP-AES metals results for the samples in this SDG were considered usable. The completeness for the ICP metals portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

## **MERCURY**

### **General**

The mercury portion of this SDG consisted of two (2) on-post groundwater samples. All samples were collected on June 7, 2016 and analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7470A. These two on-post groundwater samples were analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury samples were prepared in batch #208695. The analyses were performed undiluted.

### **Accuracy**

Accuracy was evaluated using the percent recovery obtained from the LCS.

The LCS recovery was within acceptance criteria.

### **Precision**

Precision could not be measured due to the lack of duplicate analyses.

## **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, prepared and analyzed within the holding times required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All calibration verification criteria were met.

There was one method blank and several calibration blanks associated with the mercury analyses in this SDG. All blanks were free of mercury at or above the RL.

## **Completeness**

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

Mercury result for the two samples in this SDG was considered usable. The completeness for the mercury portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.



**DATA VERIFICATION SUMMARY REPORT**  
**for on-post samples collected from**  
**CAMP STANLEY STORAGE ACTIVITY**

**BOERNE, TEXAS**

Data Verification by: Tammy Chang  
Parsons - Austin

**INTRODUCTION**

The following data verification summary report covers four groundwater samples and the associated field quality control (QC) samples collected from on-post Camp Stanley Storage Activity (CSSA) on June 17 and 20, 2016. The samples were assigned to the following Sample Delivery Group (SDG). All samples were analyzed for volatile organic compounds (VOCs) and metals including arsenic, barium, cadmium, chromium, copper, lead, zinc, and mercury.

80174

The field QC samples associated with this SDG was one trip blank (TB) and one set of matrix spike/matrix spike duplicate (MS/MSD). TB was analyzed for VOC only. MS/MSD samples were analyzed for VOC and metals. No ambient blanks were collected. During the initiation of this project, it was determined that ambient blanks were not necessary due to the absence of a source at these sites.

All samples were collected by Parsons and analyzed by APPL, Inc. following the procedures outlined in the Statement of Work and CSSA QAPP, Version 1.0. Samples in this SDG were shipped to the laboratory in one cooler. The cooler was received by the laboratory at a temperature of 4.0 °C, which was within the 2-6°C range recommended by the CSSA QAPP.

**EVALUATION CRITERIA**

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the CSSA QAPP, Version 1.0. Information reviewed in the data package included sample results; field and laboratory quality control samples; calibrations; case narratives; raw data; chain-of-custody (COC) forms and the sample receipt checklist. The findings presented in this report are based on the reviewed information, and whether the guidelines in the CSSA QAPP, Version 1.0, were met.

## **VOLATILES**

### **General**

The volatiles portion of this data package consisted of four (4) on-post groundwater samples, a set of MS/MSD, and one (1) TB. Three samples were collected on June 17, 2016 and one was collected on June 20. All samples were analyzed for a reduced list of VOCs which included: 1,1-dichloroethene, *cis*-1,2-dichloroethene, tetrachloroethene, *trans*-1,2-dichloroethene, trichloroethene, and vinyl chloride.

The VOC analyses were performed using United States Environmental Protection Agency (USEPA) SW846 Method 8260B. The samples were analyzed in two analytical batches #209048 and #209050 under one set of initial calibration (ICAL). All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method. All analyses were performed undiluted.

### **Accuracy**

Accuracy was evaluated using the percent recovery (%R) obtained from the two laboratory control spike (LCS) samples, MS/MSD, and the surrogate spikes. Sample CS-10 was designated as the parent sample for MS/MSD analyses on the chain-of-custody form.

All LCSs, MS/MSD, and surrogate spike recoveries were within acceptance criteria.

### **Precision**

Precision was evaluated based on the relative percent difference (%RPD) of the MS/MSD results.

All %RPDs were compliant.

### **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining trip and laboratory blanks for cross contamination of samples during transit or analysis.

All samples in this data package were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0. All samples were prepared and analyzed within the holding time required by the method.

- All instrument performance check criteria were met.
- All initial calibration criteria were met.

- All initial calibration verification (ICV) criteria were met. The ICV was prepared using a secondary source standard. All second source verification criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- All internal standard criteria were met.

There were two method blanks and one TB associated with the VOC analyses in this SDG. All blanks were non-detect at method detection limits for all target VOCs.

### **Completeness**

Completeness has been evaluated in accordance with the CSSA QAPP. The number of usable results has been divided by the number of possible individual analyte results and expressed as a percentage to determine the completeness of the data set.

All VOC results for the samples in this SDG were considered usable. The completeness for this SDG is 100%, which meets the minimum acceptance criteria of 95%.

## **ICP-AES METALS**

### **General**

The ICP-AES portion of this SDG consisted of four (4) on-post groundwater samples. Three samples were collected on June 17, 2016 and one sample was collected on June 20, 2016. All samples were analyzed for arsenic, barium, cadmium, chromium, copper, lead, and zinc.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. All samples were analyzed following the procedures outlined in the CSSA QAPP and were prepared and analyzed within the holding time required by the method.

The samples for ICP-AES metals were digested in batch #209304. All analyses were performed undiluted.

### **Accuracy**

Accuracy was evaluated using the percent recovery obtained from the LCS and MS/MSD.

The LCS, MS, and MSD recoveries were within acceptance criteria.

### **Precision**

Precision was measured based on the %RPD of MS and MSD concentrations.

All %RPDs were compliant.

### **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating preservation and holding times; and
- Examining laboratory blank for cross contamination of samples during analysis.

Both samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0, prepared and analyzed within the holding time required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All CCV criteria were met.
- All interference check (ICSA/ICSAB) criteria were met.
- No dilution test was required, as per the CSSA QAPP.

One method blank and several calibration blanks were analyzed in association with the ICP-AES analyses in this SDG. All blanks were free of target metals at or above the RL.

### **Completeness**

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All ICP-AES metals results for the samples in this SDG were considered usable. The completeness for the ICP metals portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

## **MERCURY**

### **General**

The mercury portion of this SDG consisted of four (4) on-post groundwater samples. Three samples were collected on June 17, 2016 and one was collected on June 20, 2016. All samples were analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7470A. These samples were analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury samples were prepared in batch #208991. The analyses were performed undiluted.

### **Accuracy**

Accuracy was evaluated using the percent recovery obtained from the LCS.

The LCS recovery was within acceptance criteria.

### **Precision**

Precision was measured based on the %RPD of the MS and MSD results.

The %RPD was compliant.

### **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the CSSA QAPP;
- Comparing actual analytical procedures to those described in the CSSA QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the CSSA QAPP, prepared and analyzed within the holding times required by the method.

- All initial calibration criteria were met.
- All second source verification criteria were met. The ICV was prepared using a secondary source.
- All calibration verification criteria were met.

There was one method blank and several calibration blanks associated with the mercury analyses in this SDG. All blanks were free of mercury at or above the RL.

### **Completeness**

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

Mercury result for the four samples in this SDG was considered usable. The completeness for the mercury portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.