MARCH 2021

On-Post
Quarterly Groundwater Monitoring Report

Prepared For

Department of the Army
Camp Stanley Storage Activity
Boerne, Texas

May 2021

EXECUTIVE SUMMARY

- Groundwater samples were collected from 4 on-post drinking water wells scheduled for sampling at Camp Stanley Storage Activity (CSSA) in March 2021.
- CSSA experienced below average rainfall during the first quarter of 2021 and the aquifer experienced a decrease from December 2020 to March 2021. The CSSA weather station (WS) at AOC-65 recorded 2.37 inches of rainfall from January to March and the B-3 WS recorded 2.99 inches during the same timeframe. The average rainfall for the Boerne area from January to March is 7.22 inches.
- At CSSA, the Middle Trinity aquifers' average groundwater elevation in March 2021 decreased 2.24 feet from the elevations measured in December 2020. The average depth to water in the wells was 292.99 feet below top of casing (BTOC) or 950.94 feet above mean sea level (MSL). As such, the Trinity-Glen Rose Groundwater Conservation District (TGRGCD) remains in 'Stage 1' conservation measures. For the adjacent Edwards aquifer, the San Antonio Water System (SAWS) has moved to 'Stage 2' watering restrictions implemented April 20, 2021.
- The maximum contaminant level (MCL) for VOCs was not exceeded in any wells sampled in March 2021.
- No wells sampled had metal detections above their corresponding MCL, action level (AL), or secondary standard (SS) in March 2021.
- No Westbay Well zones were scheduled for sampling in March 2021. However, these wells were profiled to capture water level data for the area.
- All samples collected in March 2021 were in accordance with the 2020 update to the long-term monitoring optimization (LTMO) report that has been approved by the TCEQ and USEPA.

GEOSCIENTIST CERTIFICATION

MARCH 2021 ON-POST QUARTERLY GROUNDWATER MONITORING REPORT

FOR

DEPARTMENT OF THE ARMY
CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS

I, Adrien Lindley, Professional Geologist (P.G.), hereby certify that the March 2021 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 March 2021 and is true and accurate to the best of my knowledge and belief.

Adrien Lindley, P.G.
State of Texas
Geology License No. 10487

5/18/2021
Date

Parsons Government Services, Inc.
Firm Registration No. 50316

TABLE OF CONTENTS

APPENDICES

Appendix A Evaluation of Data Quality Objectives Attainment
Appendix B Quarterly On-Post Groundwater Monitoring Analytical Results, March 2021
Appendix C Data Validation Report
Appendix D LTMO and DQO Approval Letters from the TCEQ and EPA

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
§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
cis-1,2-DCE	*cis*-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
UGR	Upper Glen Rose
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WS	Weather Station

MARCH 2021
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 March 2021. Laboratory analytical results are presented along with potentiometric contour maps. Results from all four 2021 quarterly monitoring events (March, June, September, and December) will be described in detail in the 2021 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 March 1st through 5th, 2021 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, 2015)** which provided recommendations for sampling based on an LTMO study performed for the CSSA groundwater monitoring program. The LTMO evaluation was updated in 2020 using groundwater data from monitoring conducted between 2015 and 2019. The proposed LTMO changes/updates were approved by the TCEQ and USEPA on September 18, 2020. The updated LTMO study sampling frequencies were implemented in December 2020.

2.0 POST-WIDE FLOW DIRECTION AND GRADIENT

Below average rainfall in 2020 left the aquifer depleted, however through March the aquifer levels sustained a net loss of 2.24 feet in average water level elevation beneath CSSA and decreased to 69.69 feet below the 15-year average (2006-2020). In the first quarter of 2021 the rainfall recorded was below average, 2.37 inches at the AOC-65 WS and 2.99 at the SWMU B-3 WS. The average rainfall in January through March for the Boerne area is 7.22 inches. The aquifer sustained a net loss of 2.24 feet. The San Antonio Water System (SAWS) restrictions were moved to 'Stage 2' on April 20, 2021. SAWS has been under 'Stage 1" water restrictions since October 16, 2020. The Trinity-Glen Rose Groundwater Conservation District (TGRGCD) has remained in 'Stage 1' watering restriction since July 21, 2020.

The 30-year precipitation normal for the San Antonio area for the three-month period of January through March is 6.0 inches of rainfall. Over the 3-month period of record, the AOC-65 weather station at CSSA, recorded 2.37 inches of rainfall (0.98 inches in Jan., 0.84 inches in Feb., and 0.55 inches in March). The B-3 WS recorded 2.99 inches of rainfall (1.21 inches in Jan., 1.07 inches in Feb., and 0.71 inches in March). Of the 19 rain events at the AOC-65 WS during this timeframe, no event had a daily rainfall total in excess of 1 inch while B-3 WS recorded 29 events also having no daily totals above 1 inch.

Fifty-five water level measurements were recorded on March 5, 2021 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 March 2021 are shown in **Figures 2.1, 2.2, and 2.3**, respectively.

The March 2021 potentiometric surface map for LGR-screened wells (**Figure 2.1**) exhibits a wide range of groundwater elevations, from a minimum of 889.31 feet above mean sea level (MSL) at CS-MW11A-LGR to a maximum of 1,014.41 feet above MSL at CS-MWG-LGR. Groundwater elevations are generally higher in the northern and central portions of CSSA and decrease to the southeast. As measured in all LGR screened wells, the average groundwater elevation measured in March 2021 was 953.20 feet above MSL. This is 82.63 feet below the 18.5-year average LGR groundwater elevation for the area (1029.24 feet) (**Figure 2.4**). Also shown in that figure is the 3-month precipitation total (3.37 inches) recorded at the San Antonio International Airport weather station (KSAT) and the resultant aquifer response. In March, an average decrease in LGR groundwater elevation of 1.72 feet was observed within CSSA LGR monitoring wells from the previous quarter.

Well CS-MW4-LGR, located in the central portion of CSSA, typically has one of the highest groundwater elevations of LGR-screened wells. During 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. Long-term monitoring has ascertained that when groundwater near CS-MW4-LGR rises above about 970 feet MSL, the mounding effect is evident. In March 2021, limited mounding was observed as the groundwater elevation at CS-MW4-LGR (971.96 feet MSL) was only 0.78 feet higher than CS-MW2-LGR (971.18 feet MSL) and 4.63 feet higher than CS-MW5-LGR (967.33 feet MSL).

Table 2.1
Measured Groundwater Elevation
March 2021

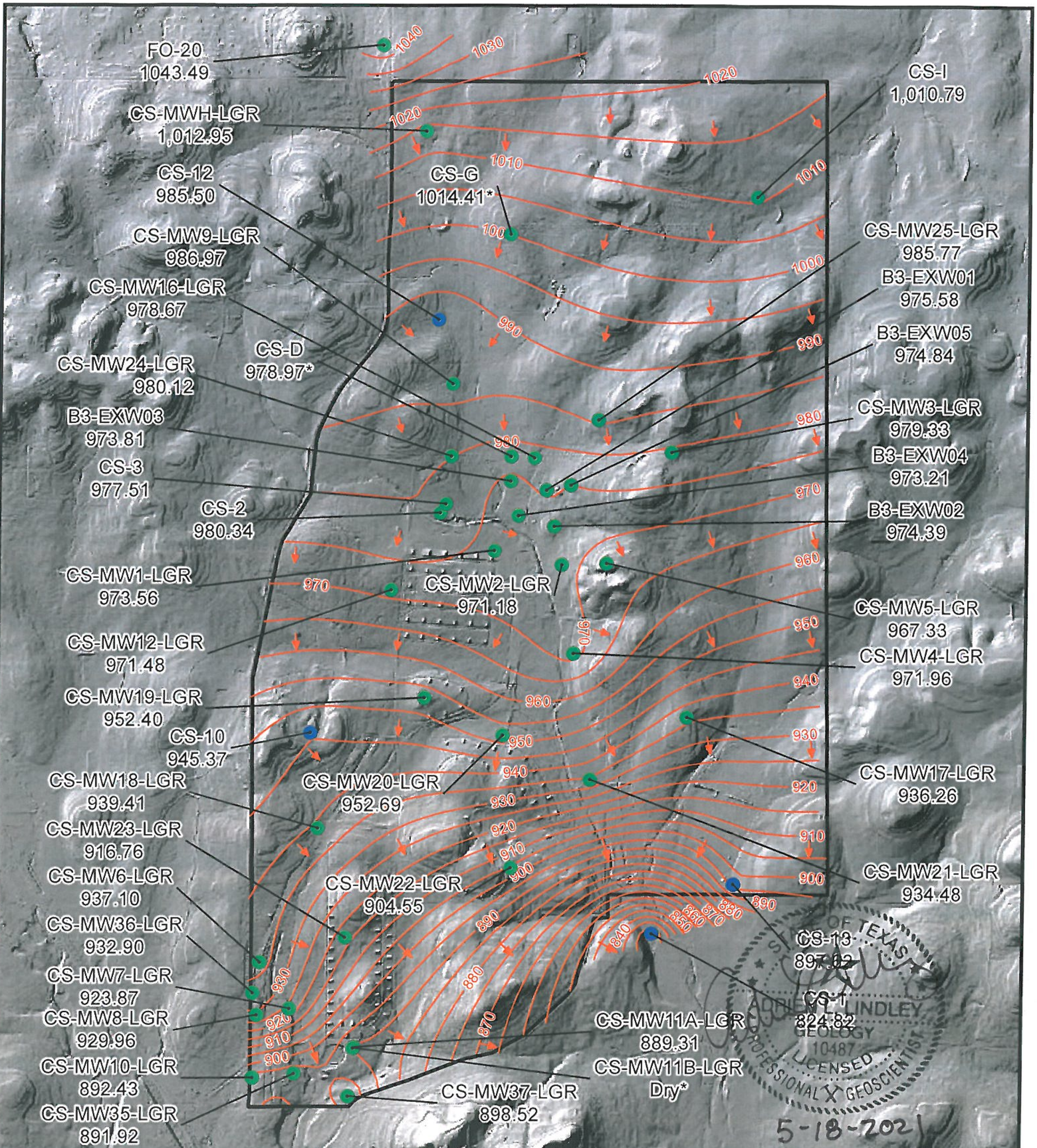
Well ID:	TOC elevation (ft MSL)	Depth to Groundwater (ft BTOC)	Groundwater Elevation (ft MSL)	Formations Screened			Date
				LGR	BS	CC	
CS-1*	1169.27	344.45	824.82	ALL			3/5/2021
CS-2	**1237.59**	**257.25**	980.34	X	?		3/5/2021
CS-3	1240.17	262.66	977.51	X			3/5/2021
CS-10	**1331.51**	**386.14**	945.37	ALL			3/5/2021
CS-12	**1274.09**	**288.59**	985.50	ALL			3/5/2021
CS-13	**1193.26**	**295.64**	897.62	ALL			3/5/2021
CS-D	1236.03	257.06	978.97	X			3/5/2021
CS-MWG-LGR	1328.14	313.73	1014.41	X			3/5/2021
CS-MWH-LGR	1319.19	306.25	1012.94	X			3/5/2021
CS-I	1315.20	304.41	1010.79	X			3/5/2021
CS-MW1-LGR	1220.73	247.17	973.56	X			3/5/2021
CS-MW1-BS	1221.09	249.95	971.14		X		3/5/2021
CS-MW1-CC	1221.39	265.52	955.87			X	3/5/2021
CS-MW2-LGR	1237.08	265.90	971.18	X			3/5/2021
CS-MW2-CC	1240.11	290.88	949.23			X	3/5/2021
CS-MW3-LGR	1334.14	354.81	979.33	X			3/5/2021
CS-MW4-LGR	1209.71	237.75	971.96	X			3/5/2021
CS-MW5-LGR	1340.24	372.91	967.33	X			3/5/2021
CS-MW6-LGR	1232.25	295.15	937.10	X			3/5/2021
CS-MW6-BS	1232.67	316.30	916.37		X		3/5/2021
CS-MW6-CC	1233.21	316.95	916.26			X	3/5/2021
CS-MW7-LGR	1202.27	278.40	923.87	X			3/5/2021
CS-MW7-CC	1201.84	295.13	906.71			X	3/5/2021
CS-MW8-LGR	1208.35	278.39	929.96	X			3/5/2021
CS-MW8-CC	1206.13	297.42	908.71			X	3/5/2021
CS-MW9-LGR	1257.27	270.30	986.97	X			3/5/2021
CS-MW9-BS	1256.73	269.52	987.21		X		3/5/2021
CS-MW9-CC	1255.95	282.15	973.80			X	3/5/2021
CS-MW10-LGR	1189.53	296.33	893.20	X			3/5/2021
CS-MW10-CC	1190.04	304.18	885.86			X	3/5/2021
CS-MW11A-LGR	1204.03	314.72	889.31	X			3/5/2021
CS-MW11B-LGR	1203.52	Dry	Dry	X			3/5/2021
CS-MW12-LGR	1259.07	287.59	971.48	X			3/5/2021
CS-MW12-BS	1258.37	285.27	973.10		X		3/5/2021
CS-MW12-CC	1257.31	290.97	966.34			X	3/5/2021
CS-MW16-LGR	1244.60	265.93	978.67	X			3/5/2021
CS-MW16-CC*	1244.51	362.27	882.24			X	3/5/2021
B3-EXW01	1245.26	269.68	975.58	X			3/5/2021
B3-EXW02	1249.66	275.27	974.39	X			3/5/2021
B3-EXW03	1235.11	261.30	973.81	X			3/5/2021
B3-EXW04	1228.46	255.25	973.21	X			3/5/2021
B3-EXW05	1279.46	304.62	974.84	X			3/5/2021
CS-MW17-LGR	1257.01	320.75	936.26	X			3/5/2021
CS-MW18-LGR	1283.61	344.20	939.41	X			3/5/2021
CS-MW19-LGR	1255.53	303.13	952.40	X			3/5/2021
CS-MW20-LGR	1209.42	256.73	952.69	X			3/5/2021
CS-MW21-LGR	1184.53	250.05	934.48	X			3/5/2021
CS-MW22-LGR	1280.49	375.94	904.55	X			3/5/2021
CS-MW23-LGR	1258.20	341.44	916.76	X			3/5/2021
CS-MW24-LGR	1253.90	273.78	980.12	X			3/5/2021
CS-MW25-LGR	1293.01	307.24	985.77	X			3/5/2021
CS-MW35-LGR	1186.97	295.05	891.92	X			3/5/2021
CS-MW36-LGR	1218.74	285.84	932.90	X			3/5/2021
CS-MW37-LGR	1205.83	307.31	898.52	X			3/5/2021
FO-20	**1327.00**	**283.51**	**1043.49**	ALL			3/5/2021
Number of wells screened in each formation.				**37**	**4**	**9**	
Average groundwater elevation in each formation given in feet (non pumping wells).				**950.17**	**961.96**	**932.85**	

Notes:
Bold wells: CS-2, 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-10, CS-12, and CS-13 are current active 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 formation.
All measurements given in feet.
NA = Data not available

Table 2.2
Change in Groundwater Elevation from Previous Quarter
March 2021

Well ID	Dec. 2020 Elevations	Mar. 2021 Elevations	GW elevation change (Dec. minus Mar.)	Formations Screened		
				LGR	BS	CC
CS-1*	888.72	824.82	63.90	ALL		
CS-2	979.93	980.34	-0.41	X	?	
CS-3	974.74	977.51	-2.77	X		
CS-10	940.43	945.37	-4.94	ALL		
CS-12	983.52	985.50	-1.98	ALL		
CS-13*	802.39	897.62	-95.23	ALL		
CS-D	976.86	978.97	-2.11	X		
CS-MWG-LGR	1011.36	1014.41	-3.05	X		
CS-MWH-LGR	1008.08	1012.94	-4.86	X		
CS-I	1008.34	1010.79	-2.45	X		
CS-MW1-LGR	968.98	973.56	-4.58	X		
CS-MW1-BS	970.23	971.14	-0.91		X	
CS-MW1-CC	949.18	955.87	-6.69			X
CS-MW2-LGR	967.73	971.18	-3.45	X		
CS-MW2-CC	944.31	949.23	-4.92			X
CS-MW3-LGR	977.61	979.33	-1.72	X		
CS-MW4-LGR	968.69	971.96	-3.27	X		
CS-MW5-LGR	964.42	967.33	-2.91	X		
CS-MW6-LGR	934.31	937.10	-2.79	X		
CS-MW6-BS	917.42	916.37	1.05		X	
CS-MW6-CC	917.10	916.26	0.84			X
CS-MW7-LGR	922.47	923.87	-1.40	X		
CS-MW7-CC	907.28	906.71	0.57			X
CS-MW8-LGR	928.05	929.96	-1.91	X		
CS-MW8-CC	909.46	908.71	0.75			X
CS-MW9-LGR	985.88	986.97	-1.09	X		
CS-MW9-BS	986.40	987.21	-0.81		X	
CS-MW9-CC	964.23	973.80	-9.57			X
CS-MW10-LGR	892.43	893.20	-0.77	X		
CS-MW10-CC	884.80	885.86	-1.06			X
CS-MW11A-LGR	888.72	889.31	-0.59	X		
CS-MW11B-LGR	995.42	Dry	NA	X		
CS-MW12-LGR	969.37	971.48	-2.11	X		
CS-MW12-BS	972.58	973.10	-0.52		X	
CS-MW12-CC	958.78	966.34	-7.56			X
CS-MW16-LGR	976.37	978.67	-2.30	X		
CS-MW16-CC*	878.41	882.24	-3.83			X
B3-EXW01	971.18	975.58	-4.40	X		
B3-EXW02	969.70	974.39	-4.69	X		
B3-EXW03	973.08	973.81	-0.73	X		
B3-EXW04*	920.41	973.21	-52.80	X		
B3-EXW05*	948.10	974.84	-26.74	X		
CS-MW17-LGR	934.47	936.26	-1.79	X		
CS-MW18-LGR	938.58	939.41	-0.83	X		
CS-MW19-LGR	951.61	952.40	-0.79	X		
CS-MW20-LGR	951.79	952.69	-0.90	X		
CS-MW21-LGR	933.29	934.48	-1.19	X		
CS-MW22-LGR	909.97	904.55	5.42	X		
CS-MW23-LGR	916.02	916.76	-0.74	X		
CS-MW24-LGR	978.41	980.12	-1.71	X		
CS-MW25-LGR	984.41	985.77	-1.36	X		
CS-MW35-LGR	890.69	891.92	-1.23	X		
CS-MW36-LGR	930.56	932.90	-2.34	X		
CS-MW37-LGR	897.13	898.52	-1.39	X		
FO-20	**1028.85**	**1043.49**	-14.64	ALL		
Average groundwater elevation change (all wells minus pumping wells)			**-2.24**			
Average groundwater elevation change in each formation (non pumping wells)				**-1.72**	**-0.30**	**-3.45**

Notes:
Bold wells: CS-2, 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-10, CS-12, and CS-13 are current active 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)

N

0 0.5 Miles

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

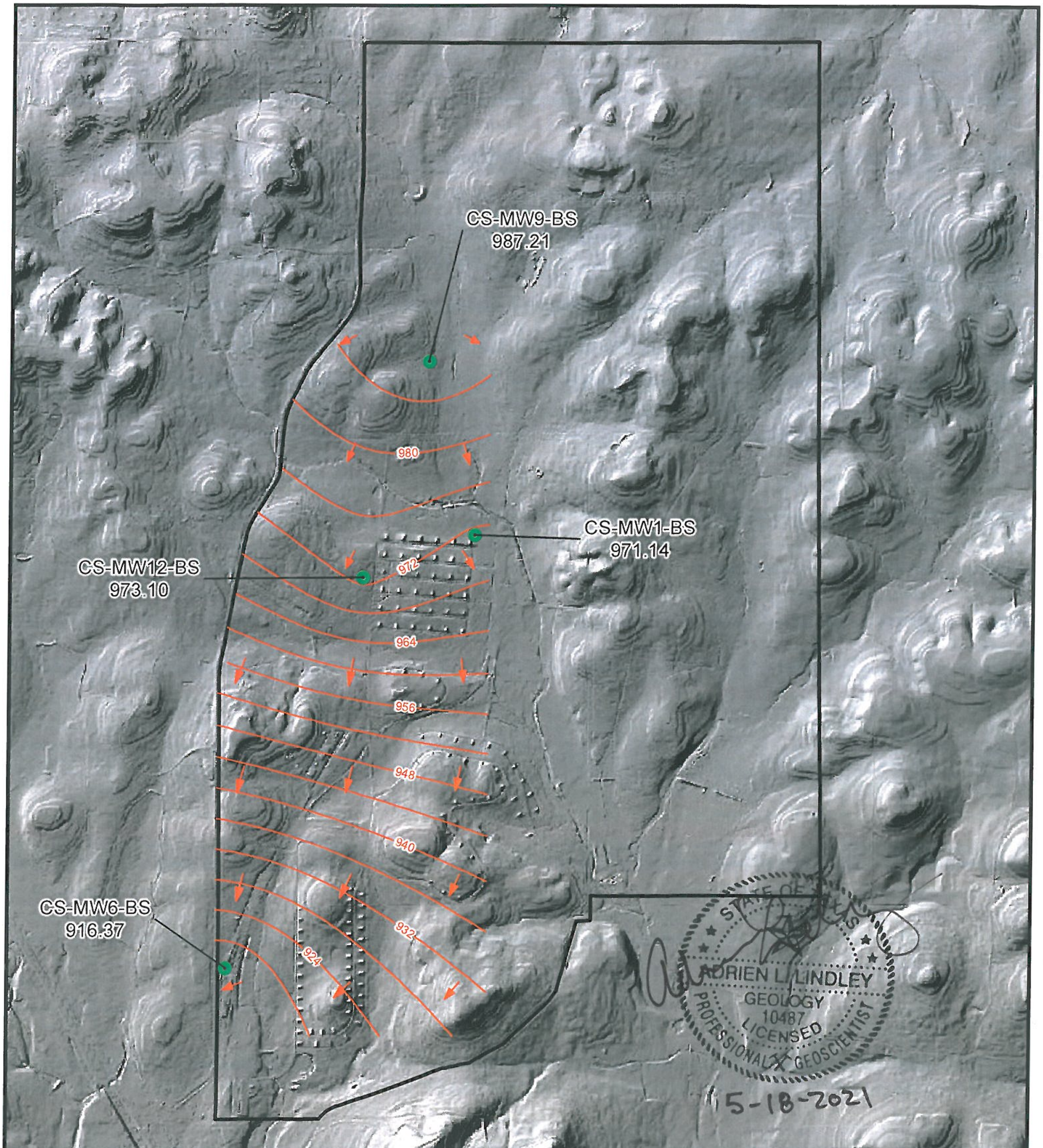
C:\CSSA\GIS\GW_POTENTIOMETRIC\MAR2021\Mar21_potentiometric_lgr.mxd - 4/14/2021 @ 1:10:09 PM

Figure 2.1

March 2021 Potentiometric Surface Map, LGR Wells

Camp Stanley Storage Activity

PARSONS



N

0 0.5 Miles

Flow direction

Outer fence

BS Groundwater Contours

BS Wells and groundwater elevation (ft above msl)

Figure E.11

March 2021 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

C:\CSSA\GIS\GW_POTENTIOMETRIC\MAR2021\Mar21_potentiometric_bs.mxd - 4/14/2021 @ 2:40:16 PM

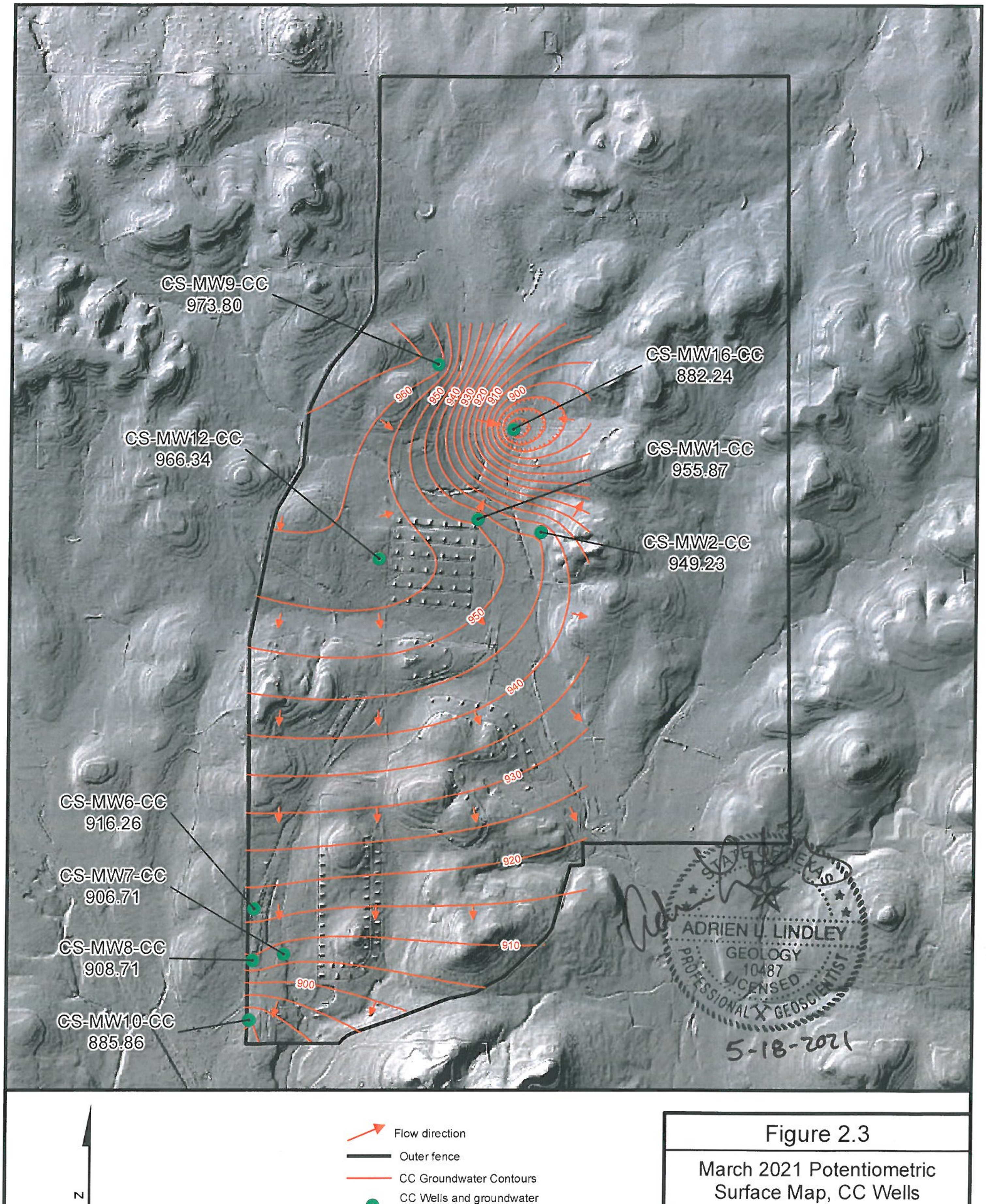


Figure 2.3

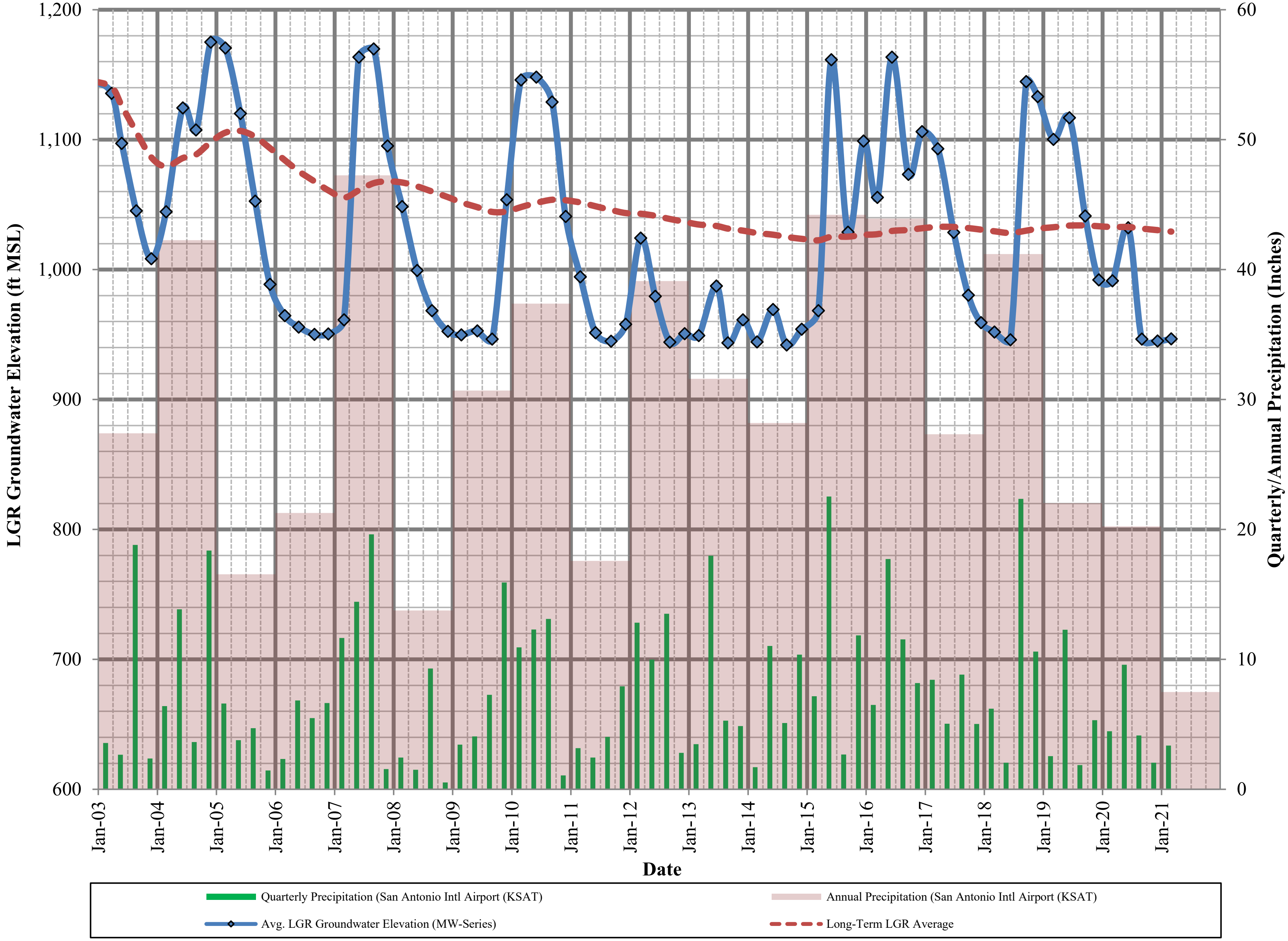
March 2021 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

C:\CSSA\GIS\GW_POTENTIOMETRIC\MAR2021\Mar21_potentiometric_cc.mxd - 4/14/2021 @ 3:03:30 PM

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 extraction wells may be manifested as "cones of depression". 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. The typical "cone of depression" is not observed in the March 2021 LGR potentiometric surface map. This is due to the limited operation of several LGR extraction wells to prevent excessive cycling of pumps and therefore reduce potential to damage installed equipment.

CSSA drinking water wells CS-1, CS-10, CS-12, and CS-13 are also cycled on and off to maintain the drinking water system currently in place at CSSA and, as a result, may manifest a cone of depression. Additionally, off-post water supply wells along Ralph Fair Road may also exert a subtle influence on gradients along the western and southern boundaries of the post. In March, a cone of depression is observed centered on the drinking water well CS-1, however, no discernable off-post influences on the LGR potentiometric surface are observed.

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**). Below average precipitation recorded during the quarter has resulted in a slight decrease in water levels from those recorded in December 2020. The typical south-southeasterly gradient is not observed in the northern portion of the post in March 2021; instead, a more southerly gradient is present. In the central portion of the post, neither the typically seen cone of depression centered on bioreactor extraction wells nor mounding at CS-MW4-LGR is observed. In the south-central portion of the post, water levels are depressed at well CS-1 due to pumping action. In the southwest corner of the post, water levels indicate a more easterly component of groundwater flow which is in part due to the depressed water level at well CS-1. At the time water level measurements were collected, pumps were running at drinking water wells CS-1 and CS-13, and bioreactor extraction wells B3-EXW-04-LGR and B3-EXW-05-LGR (Figure 2.1).

Pumping action at wells CS-1, CS-10, CS-12, CS-13, 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. The regional gradient calculation, an overall groundwater gradient averaged across CSSA, is typically measured from CS-MWH-LGR to CS-1 (0.011758 ft/ft in March 2021), however, the pump at CS-1 was running at the time of water level measurement, therefore an alternate well, CS-MW21-LGR is used instead; yielding a gradient of 0.006111 ft/ft, indicating southerly flow. At the southern end of the post a more steeply dipping southerly gradient of 0.026472 ft/ft is observed, as measured between CS-MW4-LGR and CS-1 highlighting the difference in gradients between normal groundwater gradients and the gradients induced by pumping.

Under normal conditions, the potentiometric surface in both the BS and CC members of the aquifer generally trend in a southerly direction, similar to the LGR, but during periods of above-average water levels or intense aquifer recharge, an eastward component in both the BS and CC may develop. In March 2021, the average groundwater elevation of the BS was 961.96 feet MSL, a decrease of 2.14 feet since December; and groundwater flow was mainly to the south in the northern and central portions of the post and to the south southwest in the southern portion of the post (**Figure 2.2**).

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 995 feet MSL, the gradient resumes a more southerly flow direction. In March 2021, the average groundwater elevation for all non-pumping CC wells was 932.85 feet MSL and a southerly gradient is observed, however a cone of depression centered on bioreactor extraction well CS-MW16-CC is observed, interrupting flow in the north central portion of the post (**Figure 2.3**).

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 and most recently from June 2017 to August 2018. In September 2018, historic rainfalls and above-average rains in the fourth quarter contributed to an average LGR groundwater elevation of 1,133.18 feet MSL by December (101.62 feet above the 16-year long-term average). Below average rainfall in the third and fourth quarters of 2019 resulted in a 124.76-foot decline in water level elevation from June to December. Continuing that trend through September 2020, the below average precipitation received resulted in an additional 47-foot decline in the water level elevation since December 2019. Since September 2020, below average precipitation has persisted, resulting in a less than 2-foot fluctuation in the average LGR groundwater elevation which now sits at 82.63 feet below the long-term average of 1029.24 feet (now at 18.5 years) and signifies a continuation of drought conditions.

It is worth noting that, based on more than 18 years of program history, the post wide LGR groundwater level has declined by 116.10 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 10 years, the average decline rate has subdued, losing an additional 22.39 feet of average groundwater elevation. This 10-year period included 6 years of below average precipitation (2011, 2013, 2014, 2017, 2019 and 2020) and 4 years of above average precipitation (2012, 2015, 2016, and 2018). The past 18.5-year history of CSSA groundwater monitoring indicates that the aquifer level is “below average” approximately 64.9 percent of the time. Over the last three years (12 monitoring events), the aquifer has been “below average” 58.3 percent of the time.

3.0 MARCH ANALYTICAL RESULTS

3.1 Monitoring Wells

Under the provisions of the groundwater monitoring DQOs and the 2015 LTMO evaluation, the schedule for sampling on-post in March 2021 included 4 wells. Four wells sampled included drinking water production wells: CS-1, CS-10, CS-12, and CS-13. In conjunction with the off-post monitoring initiative (under a separate report) the March 2021 groundwater sampling constituted a "quarterly" event as outlined in the 2020 LTMO schedule, which was implemented in December 2020.

All 4 wells scheduled for monitoring in March 2021 were sampled. Additional samples were collected as part of the AOC-65 in-situ chemical oxidation (ISCO) and SWMU B-3 bioreactor Corrective Measures operations; these results will be documented in separate reports. **Tables 3.1** and **3.2** provide a sampling overview for March 2021 and the schedule under the LTMO recommendations. The wells listed in **Table 3.1** are sampled using dedicated low-flow gas-operated bladder pumps. Wells CS-1, CS-10, CS-12, and CS-13 were sampled using dedicated electric submersible pumps. **Figure 3.1** shows well sampling locations.

All wells sampled were purged until the field parameters of pH, temperature, and conductivity stabilized. The on-post wells were sampled in March 2021 for volatile organic compounds (VOCs) analytes which include *cis*-1,2-dichloroethene (*cis*-1,2-DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride. Metals analyses is included in active groundwater remediation sites (AOC-65 and B-3), as well as on-post drinking water wells. As such, active drinking water wells CS-1, CS-10, CS-12, and CS-13 were analyzed for the same VOC analytes 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**.

No wells sampled this quarter had VOCs detected above the applicable Maximum Contaminant Levels (MCL). A comparison of VOC concentrations versus water level for select wells is presented in **Figure 3.2**. The overall trend for CS-D, CS-MW1-LGR, CS-MW5-LGR, CS-MW36-LGR last sampled in December 2020 was a slight increase in VOC concentrations with a significant decrease in groundwater elevation. CS-MW5-LGR has been sampled since 2001, but it did not show concentrations of PCE and TCE above the MCL until December 2015. PCE and TCE remained above the MCL through 2017 then dropped back below in 2018. TCE was detected above the MCL again in December 2019. In December 2020 no VOC were above the MCL in well CS-MW5-LGR. This quarter the overall groundwater elevation in all wells indicates the depleted aquifer which showed slight recovery after a significant decline in September. Wells presented in **Figure 3.2** are sampled every 15 months according to the current LTMO, with the next scheduled event occurring in March 2022. It should be noted that well CS-4 has been plugged and abandoned and well CS-3 has been added to this figure as it is currently being evaluated as a replacement for CS-4.

Table 3-1
Overview of On-Post Sampling for March 2021

Count	Well ID	*Analytes*	*Last Sample Date*	*Jun-20*	*Sep-20*	*Dec-20 (15 month)*	*Mar-21*	*LTMO Sampling Frequency**
	CS-MW1-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW1-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW1-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW2-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW2-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW3-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW4-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW5-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW6-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW6-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW6-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW7-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW7-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW8-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW8-CC	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW9-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW9-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW9-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW10-LGR	VOCs	Dec-19	NS	NS	NSWL	NS	15 months
	CS-MW10-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW11A-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW11B-LGR	VOCs	Sep-18	NS	NS	NSWL	NS	15 months
	CS-MW12-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW12-BS	VOCs	Dec-12	NS	NS	NS	NS	as needed
	CS-MW12-CC	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CW-MW17-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW18-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW19-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
1	CS-1	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Dec-20	S	S	S	S	Quarterly
	CS-2	VOCs	Jun-20	S	NS	NS	NS	30 months
	CS-3	VOCs	Dec-20	S	S	S	NS	15 months
2	CS-10	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Dec-20	S	S	S	S	Quarterly
3	CS-12	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Dec-20	S	S	S	S	Quarterly
4	CS-13	VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn)	Dec-20	S	S	S	S	Quarterly
	CS-D	VOCs	Dec-19	NS	NS	NSWL	NS	15 months
	CS-MWG-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MWH-LGR	VOCs	Jun-17	NS	NS	NS	NS	30 months
	CS-I	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW20-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW21-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW22-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW23-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW24-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW25-LGR	VOCs	Dec-19	NS	NS	NS	NS	30 months
	CS-MW35-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW36-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months
	CS-MW37-LGR	VOCs	Dec-20	NS	NS	S	NS	15 months

Notes/Abrreviations:
* New LTMO sampling frequency implemented December 2020.
S = Sample
NS = No Sample
NSWL = no sample due to water level falling below dedicated pump.

J:\CSSA Program\Restoration\Groundwater\GW Monitoring Reports\2021\March

Table 3-2
Overview of Westbay Sampling for March 2021

Westbay Interval	Last Sample Date	Jun-20	Sep-20	Dec-20 (15 month)	Mar-21	LTMO Sampling Frequency (as of Dec. 2020)
CS-WB01-UGR-01	Sep-18	NS	NS	NSWL	NS	15 months
CS-WB01-LGR-01	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-02	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-03	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-04	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-05	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-06	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-07	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-08	Dec-20	NS	NS	S	NS	15 months
CS-WB01-LGR-09	Dec-20	NS	NS	S	NS	15 months
CS-WB02-UGR-01	Dec-04	NS	NS	NS	NS	port clogged
CS-WB02-LGR-01	Sep-18	NS	NS	NSWL	NS	15 months
CS-WB02-LGR-02	Sep-18	NS	NS	NSWL	NS	15 months
CS-WB02-LGR-03	Dec-20	NS	NS	S	NS	15 months
CS-WB02-LGR-04	Dec-20	NS	NS	S	NS	15 months
CS-WB02-LGR-05	Dec-20	NS	NS	S	NS	15 months
CS-WB02-LGR-06	Dec-20	NS	NS	S	NS	15 months
CS-WB02-LGR-07	Dec-20	NS	NS	S	NS	15 months
CS-WB02-LGR-08	Dec-20	NS	NS	S	NS	15 months
CS-WB02-LGR-09	Dec-20	NS	NS	S	NS	15 months
CS-WB03-UGR-01	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-01	Dec-19	NS	NS	NSWL	NS	15 months
CS-WB03-LGR-02	Jun-16	NS	NS	NSWL	NS	15 months
CS-WB03-LGR-03	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-04	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-05	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-06	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-07	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-08	Dec-20	NS	NS	S	NS	15 months
CS-WB03-LGR-09	Dec-20	NS	NS	S	NS	15 months
CS-WB04-UGR-01	Nov-04	NS	NS	NSWL	NS	15 months
CS-WB04-LGR-01	Dec-20	NS	NS	S	NS	15 months
CS-WB04-LGR-02	Mar-10	NS	NS	NS	NS	30 months
CS-WB04-LGR-03	Dec-19	NS	NS	NS	NS	30 months
CS-WB04-LGR-04	Dec-19	NS	NS	NS	NS	30 months
CS-WB04-LGR-06	Dec-20	NS	NS	S	NS	15 months
CS-WB04-LGR-07	Dec-20	NS	NS	S	NS	15 months
CS-WB04-LGR-08	Dec-20	NS	NS	S	NS	15 months
CS-WB04-LGR-09	Dec-20	NS	NS	S	NS	15 months
CS-WB04-LGR-10	Dec-20	NS	NS	S	NS	15 months
CS-WB04-LGR-11	Dec-20	NS	NS	S	NS	15 months
CS-WB04-BS-01	Dec-20	NS	NS	S	NS	15 months
CS-WB04-BS-02	Dec-20	NS	NS	S	NS	15 months
CS-WB04-CC-01	Dec-20	NS	NS	S	NS	15 months
CS-WB04-CC-02	Dec-20	NS	NS	S	NS	15 months
CS-WB04-CC-03	Dec-20	NS	NS	S	NS	15 months

Profiling performed quarterly, in conjunction with post wide water levels.
S = sample
NS = no sample
NSWL = no sample due to dry port.

Figure 3-1

On-Post and Off-Post Well Sampling Locations for March 2021

Camp Stanley Storage Activity

PARSONS

Table 3.3
March 2021 On-Post Quarterly Groundwater Results, Detected Analytes

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CSSA Drinking Water Well System									
CS-1	3/3/2021	**0.00136F**	**0.0343**	--	--	--	--	**0.075**	--
CS-10	3/3/2021	**0.00265F**	**0.041**	--	--	**0.025**	**0.0056F**	**0.778**	--
CS-12	3/3/2021	**0.00306F**	**0.0316**	--	--	--	--	**0.215**	--
CS-12 FD	3/3/2021	--	**0.0335**	--	--	--	--	**0.234**	--
CS-13	3/3/2021	**0.00098F**	**0.0297**	--	--	**0.005F**	--	**0.252**	--
Comparison Criteria									
Method Detection Limit (MDL)		**0.00022**	**0.0003**	**0.0005**	**0.001**	**0.003**	**0.0019**	**0.008**	**0.0001**
Reporting Limit (RL)		**0.03**	**0.005**	**0.007**	**0.01**	**0.01**	**0.025**	**0.05**	**0.001**
Max. Contaminant Level (MCL)		**0.01**	**2**	**0.005**	**0.1**	**AL=1.3**	**AL=0.015**	**SS=5.0**	**0.002**

Well ID	Sample Date	cis-1,2-DCE	PCE	TCE	Vinyl Chloride
CSSA Drinking Water Well System					
CS-1	3/3/2021	--	--	--	--
CS-10	3/3/2021	--	--	--	--
CS-12	3/3/2021	--	--	--	--
CS-12 FD	3/3/2021	--	--	--	--
CS-13	3/3/2021	--	--	--	--
Comparison Criteria					
Method Detection Limit (MDL)		**0.07**	**0.06**	**0.05**	**0.08**
Reporting Limit (RL)		**1.2**	**1.4**	**1**	**1.1**
Max. Contaminant Level (MCL)		**70**	**5**	**5**	**2**

BOLD	≥ MDL
BOLD	≥ RL
BOLD	≥ MCL

Precipitation per Quarter:	Mar-21
AOC-65 Weather Station (AOC-65 WS)	2.32
B-3 Weather Station (B-3 WS)	2.99

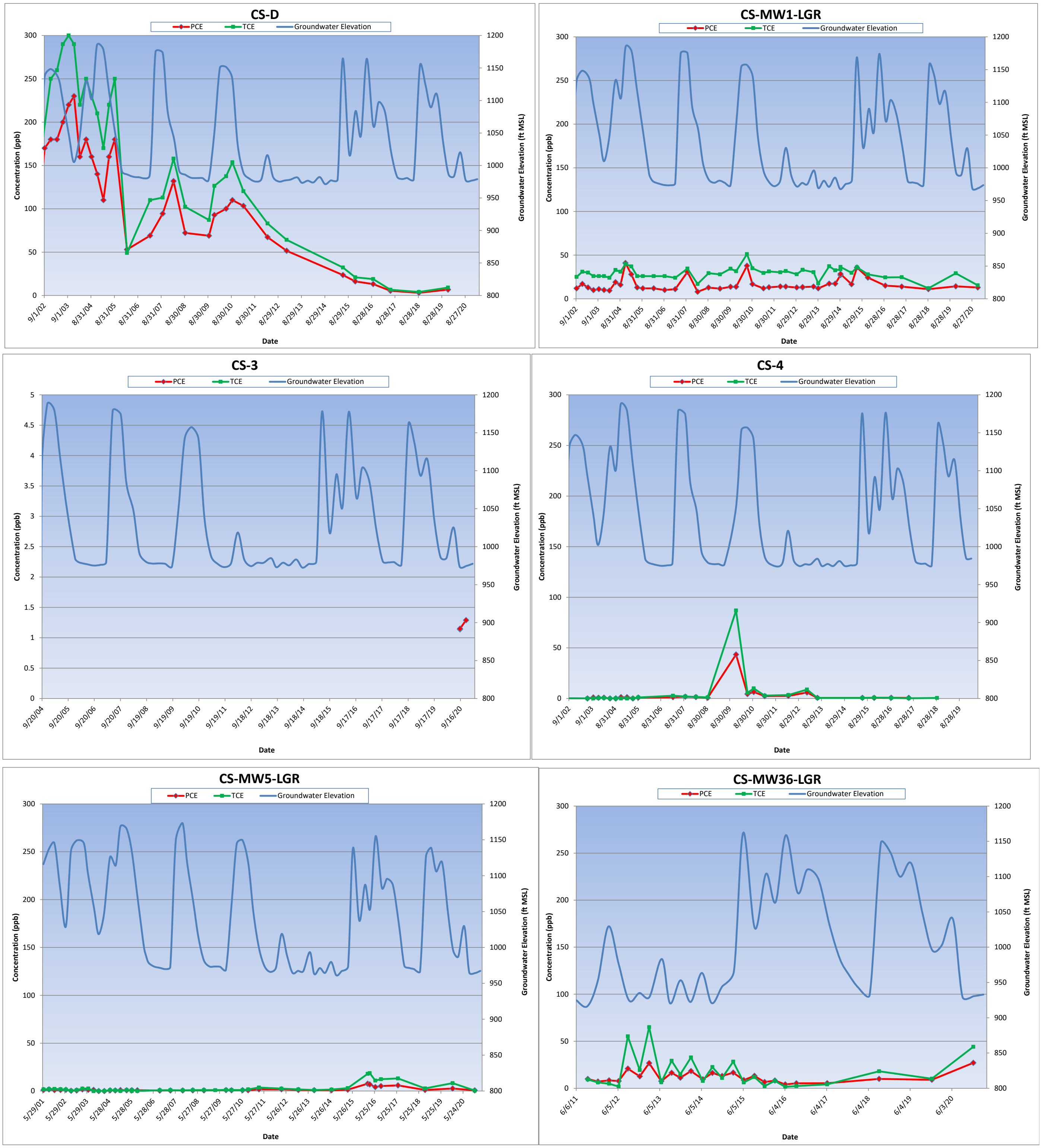
All samples were analyzed by APPL, Inc.
VOC data reported in ug/L & metals data reported in mg/L.

Abbreviations/Notes:

FD	Field Duplicate
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	Dichloroethene
AL	Action Level
SS	Secondary Standard

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.
J - Analyte detected, concentration estimated.

Figure 3.2
On-Post Cumulative Analytical vs. Groundwater Elevation



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

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 package numbered CS12FF-#45 containing the analytical results from this sampling event, were received by Parsons April 15, 2021. Data validation was conducted, and data validation reports are presented in **Appendix D**.

3.2 Westbay-equipped Wells

The latest updated LTMO schedule was implemented in December 2020. In March 2021, no Westbay Well zones were scheduled for sampling. However, these wells (CS-WB01, CS-WB02, CS-WB03, and CS-WB04) were profiled to capture water level data. These Westbay wells are located in the vicinity of AOC-65 and are part of the post-wide quarterly groundwater monitoring program. Per the approved 2020 LTMO, the Upper Glen Rose (UGR)/LGR/BS/CC zones are to be sampled on a 15-month schedule. Select LGR zones from WB04 are sampled on a 30-month schedule. The sampling of these wells began in September 2003.

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.

4.0 MARCH 2021 SUMMARY

- Groundwater samples were collected from 4 on-post wells scheduled for monitoring in March 2021 at CSSA.
- From January 1st through March 31st, 2021, CSSA's AOC-65 weather station recorded 2.37 inches of rainfall and the SWMU B-3 weather station recorded 2.99 inches. Most of the rainfall this quarter fell in January. The AOC-65 WS recorded 0.98 inches in January, 0.84 inches in February, and 0.55 inches in March. No event had greater than one inch of daily rainfall during this period. The B-3 weather station recorded 1.21 inches in January, 1.07 inches in February, and 0.71 inches in March. This station also recorded no daily rain events greater than 1 inch.
- The Middle Trinity aquifer levels (LGR, BS, and CC) decreased an average of 2.24 feet per non-pumping well since last quarter. The average water level in March (excluding pumping wells) was 292.99 feet BTOC (950.94 feet MSL).
- No VOCs were detected above the MCL in wells sampled in March 2021. (**Table 3.3**).
- There were no metals detected above the MCL/AL/SS in the wells sampled in March 2021.
- Westbay Wells 01-04 were not sampled in March 2021 per LTMO sampling schedule. However, these wells were profiled to capture water level data in the area. These wells are scheduled to be sampled in March 2022.
- The 2020 update to the LTMO and DQOs was approved by the EPA and TCEQ in September 2020, see **Appendix D**. These updated schedules were implemented in December 2020.

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, PSHEP, 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 March 5, 2021.	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 March 5, 2021 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 15 or 30 months.	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, and CS-MW8-CC. 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, CS-13, 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 2021 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 all 4 CSSA drinking water wells. The 4 BS wells are sampled on an 'as needed' basis 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-1, CS-10, CS-12, and CS-13. Samples were analyzed for the short list of VOCs using USEPA method SW8260B. The drinking water wells were also sampled for metals (arsenic, barium, chromium, copper, cadmium, mercury, lead, 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.	**ANALYTE** / **RL (µg /L)** / **MCL(µg/L)** *cis*-1,2-DCE 1.2 70 PCE 1.4 5 TCE 1.0 5 Vinyl chloride 1.1 2	Yes.	Continue sampling.
		ANALYTE / **RL (µg/L)** / **MCL/AL (µg /L)** 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	Yes.	Continue sampling.
	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 2021

Appendix B
Quarterly On-Post Groundwater Monitoring Analytical Results, March 2021

Well ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Mercury
CSSA Drinking Water Well System									
CS-1	3/3/2021	**0.00136F**	**0.0343**	0.0005U	0.0010U	0.003U	0.0019U	**0.075**	0.0001U
CS-10	3/3/2021	**0.00265F**	**0.041**	0.0005U	0.0010U	**0.025**	**0.0056F**	**0.778**	0.0001U
CS-12	3/3/2021	**0.00306F**	**0.0316**	0.0005U	0.0010U	0.003U	0.0019U	**0.215**	0.0001U
CS-12 FD	3/3/2021	0.00022U	**0.0335**	0.0005U	0.0010U	0.003U	0.0019U	**0.234**	0.0001U
CS-13	3/3/2021	**0.00098F**	**0.0297**	0.0005U	0.0010U	**0.005F**	0.0019U	**0.252**	0.0001U
Comparison Criteria									
Method Detection Limit (MDL)		0.00022	0.0003	0.0005	0.001	0.003	0.0019	0.008	0.0001
Reporting Limit (RL)		0.03	0.005	0.007	0.01	0.01	0.025	0.05	0.001
Max. Contaminant Level (MCL)		0.01	2	0.005	0.1	AL=1.3	AL=0.015	SS=5.0	0.002

Well ID	Sample Date	cis-1,2-DCE	PCE	TCE	Vinyl Chloride
CSSA Drinking Water Well System					
CS-1	3/3/2021	0.07U	0.06U	0.05U	0.08U
CS-10	3/3/2021	0.07U	0.06U	0.05U	0.08U
CS-12	3/3/2021	0.07U	0.06U	0.05U	0.08U
CS-12 FD	3/3/2021	0.07U	0.06U	0.05U	0.08U
CS-13	3/3/2021	0.07U	0.06U	0.05U	0.08U
Comparison Criteria					
Method Detection Limit (MDL)		0.07	0.06	0.05	0.08
Reporting Limit (RL)		1.2	1.4	1.0	1.1
Max. Contaminant Level (MCL)		70	5	5	2

BOLD	≥ MDL
BOLD (blue)	≥ RL
BOLD (red)	≥ 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
Data Qualifiers:
F-The analyte was positively identified but the associated numerical value is below the RL.
J - Analyte detected, concentration estimated.
U-The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.

APPENDIX C

DATA VALIDATION REPORT
SDG 95321

DATA VERIFICATION SUMMARY REPORT

for groundwater samples collected from

CAMP STANLEY STORAGE ACTIVITY

BOERNE, TEXAS

Data Verification by: Sandra de las Fuentes
Parsons - Austin

INTRODUCTION

The following data verification summary report covers five water samples collected from Camp Stanley Storage Activity (CSSA) March 3, 2021. The samples were assigned to the following Sample Delivery Group (SDG).

95321

The field QC sample associated with this SDG was one trip blank (TB), one matrix spike/matrix spike duplicate (MS/MSD) set, and one field duplicate (FD). 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 a single cooler, which was received by the laboratory at an acceptable temperature of 2.5ºC.

SAMPLE IDs AND REQUESTED PARAMETERS

Sample ID	Matrix	VOCs	Metals	Mercury	Comments
TB-1	Water	X			
CS-12	Water	X	X	X	
CS-12-FD	Water	X	X	X	FD of CS-12
CS-13	Water	X	X	X	MS/MSD
CS-1	Water	X	X	X	
CS-10	Water	X	X	X	

EXTRACTION, ANALYTICAL, AND REPORTING DETAILS

Parameter	Matrix	Prep Method	Analytical Method	Units
VOCS	WATER	SW5030B	SW8260B	µg/L
METALS	WATER	SW3010A	SW6010B	mg/L

Parameter	Matrix	Prep Method	Analytical Method	Units
MERCURY	WATER	SW7470A	SW7470A	mg/L

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) groundwater samples, one (1) TB, one (1) MS/MSD set and one (1) FD. All samples were collected on March 3, 2021 and analyzed for a reduced list of VOCs which included: *cis*-1,2-dichloroethene (cis 1,2-DCE), tetrachloroethene, trichloroethene (TCE), and vinyl chloride.

The VOC analyses were performed using United States Environmental Protection Agency (USEPA) SW846 Method 8260B. The samples were analyzed in a single analytical batch, #262368, under one 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 sample (LCS), MS/MSD, and the surrogate spikes. Sample CS-13 was designated as the MS/MSD on the COC.

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

Precision

Precision was evaluated using the relative percent difference (RPD) obtained from the MS/MSD results. Precision was further evaluated by comparing the field duplicate analyte results. Sample CS-12-FD was collected and analyzed as the field duplicate of CS-12.

The MS/MSD RPDs were within acceptance criteria.

The FD/parent sample results were all non-detect; therefore, FD RPD could not be evaluated.

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 blank and TB for cross contamination of samples during sample collection, transportation, and 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 continuing calibration verification (CCV) criteria were met.
- All internal standard criteria were met.

One method blank was associated with the VOC analyses in this SDG. The MB was non-detect for all target VOCs.

There was one trip blank sample associated with the VOC analyses in this SDG. The TB was also non-detect 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) groundwater samples, one (1) MS/MSD and one (1) FD. All samples were collected on March 3, 2021. The 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 #261823. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, MS, and MSD. Sample CS-13 was designated as the MS/MSD on the COC.

All LCS, MS, and MSD recoveries were within acceptance.

Precision

Precision was measured based on the RPD of MS/MSD results and parent/FD sample results. Sample CS-12-FD was collected and analyzed as the field duplicate of CS-12.

All RPDs were compliant for the MS/MSD.

All target metals that were detected above the reporting limit (RL) in the parent and FD samples, met criteria.

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.

All 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.
- Dilution test (DT) was not applicable since all target metals met criteria in the MS/MSD.
- Post digestion spike (PDS) was also not applicable since all target metals met criteria in the MS/MSD samples.
- The initial calibration blank (ICB) and continuing calibration blank (CCB) samples were all non-detect.

One method blank was analyzed in association with the ICP-AES analyses in this SDG. The method blank was 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) groundwater samples, one (1) MS/MSD set and one (1) FD. All samples were collected on March 3, 2021 and were analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7470A. The sample was 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 #261961. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS and MS/MSD. Sample CS-13 was designated as the MS/MSD on the COC.

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

Precision

Precision was measured based on the RPD of MS/MSD results and parent/FD sample results. Sample CS-12-FD was collected and analyzed as the field duplicate of CS-12.

The RPD was compliant for the MS/MSD.

The FD/parent sample results were non-detect; therefore, FD RPD could not be evaluated.

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 CCV 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.

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 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 95%.

APPENDIX D

LTMO AND DQO APPROVAL LETTERS FROM THE TCEQ AND EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102

Transmitted via e-mail

September 23, 2020

Mr. John Ferguson
Acting Installation Manager
Camp Stanley Storage Activity
25800 Ralph Fair Road
Boerne, TX 78015-4800

RE: *2020 Revision of Data Quality Objectives (DQOs) – Groundwater Monitoring Program*
Camp Stanley Storage Activity, Boerne, Texas

Dear Mr. Ferguson:

The 2020 Revision of Data Quality Objectives (DQOs) – Groundwater Monitoring Program for Camp Stanley Storage Activity (CSSA) has been reviewed by the U.S. EPA in accordance with the final Resource Conservation and Recovery Act (RCRA) § 3008(h) Administrative Order on Consent for CSSA, (Order) Docket No. RCRA-VI 002(h)99-H FY99, dated May 5, 1999.

The purpose of the 2020 DQOs revision is to incorporate recent changes in the groundwater monitoring program, including implementing the 2020 Long Term Monitoring Optimization (LTMO) recommendations for both on-post and off post wells. The revised DQO's meets the temporal and spatial objectives of the CSSA groundwater monitoring program. The EPA approves the 2020 Revision, and it should be incorporated into the overall CSSA groundwater monitoring program.

Please add the 2020 DQO Revision to the Administrative Record at https://www.stanley.army.mil. If you have any questions, please feel to contact me at 214-665-8317 or via e-mail at lyssy.gregory@epa.gov.

Sincerely,

Greg J. Lyssy

Greg J. Lyssy
Senior Project Manager
RCRA Corrective Action Section (6LCR-RC)

cc: Margarita Loya, CSSA
Tim Brown, TCEQ
Jorge Salazar, TCEQ
Laurie King, EPA
Julie Burdey, Parsons
Shannon Schoepflin, Parsons
Scott Pearson. Parsons

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102

Transmitted via e-mail

September 18, 2020

Mr. John Ferguson
Acting Installation Manager
Camp Stanley Storage Activity
25800 Ralph Fair Road
Boerne, TX 78015-4800

RE: *RCRA Three-Tiered Long Term Monitoring Network Optimization Evaluation*
Camp Stanley Storage Activity, Boerne, Texas

Dear Mr. Ferguson:

The Three-Tiered Long Term Monitoring Network Optimization (LTMO) Evaluation, dated May 2020, for Camp Stanley Storage Activity (CSSA), has been reviewed by the U.S. EPA in accordance with the final Resource Conservation and Recovery Act (RCRA) § 3008(h) Administrative Order on Consent for CSSA, (Order) Docket No. RCRA-VI 002(h)99-H FY99, dated May 5, 1999.

The purpose of the LTMO Evaluation is to ensure that the groundwater monitoring program adequately addresses the monitoring requirements of the remedial actions at the Site, both temporally and spatially. CSSA has been collecting groundwater data since the early 1990's and has optimized the monitoring program several times to ensure that an optimal monitoring program is in place. The proposed sampling schedule in the LTMO Evaluation meets the temporal and spatial objectives of the CSSA groundwater monitoring program and is hereby approved.

Please add the Evaluation to the Administrative Record at *https://www.stanley.army.mil*. If you have any questions, please feel to contact me at 214-665-8317 or via e-mail at *lyssy.gregory@epa.gov*.

Sincerely,

Greg J. Lyssy

Greg J. Lyssy
Senior Project Manager
RCRA Corrective Action Section (6LCR-RC)

cc: Margarita Loya, CSSA
Tim Brown, TCEQ
Jorge Salazar, TCEQ
Laurie King, EPA
Julie Burdey, Parsons
Shannon Schoepflin, Parsons
Adrian Lindley, Parsons

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

September 18, 2020

Via E-mail

Mr. John Ferguson
Installation Manager
Camp Stanley Storage Activity
25800 Ralph Fair Road
Boerne, TX 78015

Re: Approval
Data Quality Objectives Groundwater Monitoring Program and Three-Tiered Long-Term Monitoring Network Optimization Evaluation, dated September 15, 2020
Camp Stanley Storage Activity, Boerne, Texas
TCEQ SWR No. 69026; CN602728206; RN100662840
EPA ID No. TX2210020739

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced submittal that documented the optimization of the sampling and analysis plans for the site. The TCEQ concurs with the recommended optimization; please proceed with its implementation.

Questions concerning this letter should be directed to me at (512) 239-6526. When responding by mail, please submit one paper copy and one electronic copy (on USB or disc) of all correspondence and reports to the TCEQ Remediation Division at Mail Code MC-127. An additional copy should be submitted in electronic format to the local TCEQ Region Office. The information in the reference block should be included in all submittals. Note that the electronic and hard copies should be identical, complete copies. A Correspondence ID Form (TCEQ Form 20428) must accompany each document submitted to the Remediation Division and should be affixed to the front of your submittal. The Correspondence ID Form helps ensure that your documents are identified correctly and are routed to the applicable program for a timely response.

Sincerely,

Timothy Brown

Timothy Brown, Project Manager
Team 1, VCP-CA Section
Remediation Division
Texas Commission on Environmental Quality

TKB/mdh

cc: Ms. Julie Burdy, Parsons Inc., 9101 Burnet Road, Suite 210, Austin, TX 78758
Via E-mail

Mr. Cameron Lopez, Waste Section Manager, TCEQ Region 13 Office, San Antonio
Via E-mail