# SEPTEMBER 2014

# On-Post
# Quarterly Groundwater Monitoring Report

*Prepared For*

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

## December 2014

## EXECUTIVE SUMMARY

- Nineteen wells were scheduled and/or added to the sampling schedule in September 2014. Six wells were not sampled due to water levels falling below the pump.
- At CSSA, the Middle Trinity aquifer average groundwater elevations in September 2014 decreased 26.88 feet from the elevations measured in June 2014. The average depth to water in the wells was 298.52 feet below top of casing (BTOC) or 943.95 feet above mean sea level (MSL). As such, the Trinity-Glen Rose Groundwater Conservation District (TGRGCD) and CSSA remain under Stage 2 severe drought water restrictions, which went into effect June 1, 2011. For the adjacent Edwards aquifer, the San Antonio Water System (SAWS) has been in Stage 2 water restrictions since May 1, 2012. And the Edwards Aquifer Authority (EAA) declared Stage 3 restrictions for the San Antonio "Pool" of the Edwards Aquifer on April 10, 2014.
- The maximum contaminant level (MCL) was exceeded in monitoring wells CS-MW1-LGR, and CS-MW36-LGR for tetrachloroethene (PCE) and trichloroethene (TCE) in September 2014.
- No wells sampled had metal detections above their corresponding MCL, action level (AL), or secondary standard (SS) in September 2014.
- The 4 Westbay Wells (WB01-WB04) were not sampled in September 2014. However, these wells were profiled to collect water level data in the area. All Lower Glen Rose (LGR) zones included in the 9 month schedule will be sampled in December 2014.
- The data quality objectives (DQOs) and the long term monitoring optimization (LTMO) are currently under review and will be submitted to the Texas Commission on Environmental Quality (TCEQ) and US Environmental Protection Agency (USEPA) for approval.

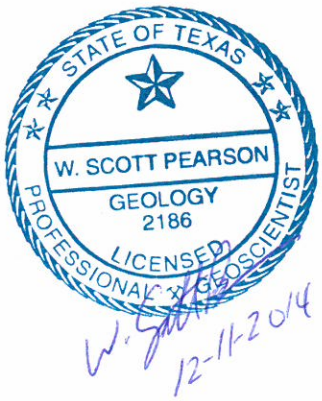
## GEOSCIENTIST CERTIFICATION

## SEPTEMBER 2014 ON-POST QUARTERLY GROUNDWATER MONITORING REPORT

## FOR

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

I, W. Scott Pearson, P.G., hereby certify that the September 2014 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 September 2014, and is true and accurate to the best of my knowledge and belief.




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

12-11-2014
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 |
| *cis*-1,2-DCE | *cis*-1,2-Dichloroethene |
| COC | contaminants of concern |
| CSSA | Camp Stanley Storage Activity |
| DQO | Data Quality Objectives |
| EAA | Edwards Aquifer Authority |
| FO | Fair Oaks |
| 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 |
| QAPP | Quality Assurance Program Plan |
| 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 |
| *trans*-1,2-DCE | *trans*-1,2-Dichloroethene |
| UGR | Upper Glen Rose |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |
| WS | Weather Station |

# SEPTEMBER 2014 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 September 2014. Laboratory analytical results are presented along with potentiometric contour maps. Results from all four 2014 quarterly monitoring events (March, June, September, and December) will be described in detail in an 2014 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 September 2-17, 2014.

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 **3008(h) Administrative Order on Consent** (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 a 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. The LTMO and DQOs are scheduled to be updated again in 2015 as part of the revision of the USEPA RCRA Administrative Order. The proposed changes/updates will be submitted to the TCEQ and USEPA for their approval and they will be briefed to the public during the 2015 public meeting.

## 2.0 POST-WIDE FLOW DIRECTION AND GRADIENT

Fifty-five water level measurements were recorded on September 2, 2014 from on-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 September 2014 are shown in **Figures 2.1, 2.2, and 2.3**, respectively.

The September 2014 potentiometric surface map for LGR-screened wells **(Figure 2.1)** exhibited a wide range of groundwater elevations, from a minimum of 873.17 feet above mean sea level (MSL) at CS-1 to a maximum of 1007.24 feet above MSL at CS-MWH-LGR. 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 wells, the average groundwater elevation in September 2014 decreased 26.88 feet from the elevations measured in June 2014. From June 27 to September 17, 2014, the southern weather station at AOC-65 (WS AOC-65) recorded 5.09 inches of rainfall during 15 rainfall events in this timeframe. The rainfall was sporadic with a majority of the rain falling in August, 3.31 inches. One event had greater than one inch of rain, 1.62 on July 18$^{th}$. The northern or B-3 weather station recorded 6.25 inches of precipitation for the same time period. San Antonio fell back into Stage 2 water restrictions on May 1, 2012 and the TGRGCD remains in Stage 2 severe drought water restrictions, effective since June 1, 2011.

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 September 2014 this mounding effect was muted, as the elevation in CS-MW4-LGR was 4 foot and 1 foot lower 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 September 2014, the water elevation at CS-MW4-LGR was 960.30 feet MSL, and the typical mounding effect was not discernible.

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. This continuous pumping action creates a notable "cone of depression" in the central portion of the post. These remediation wells provide groundwater to the Bioreactor system, and are automatically operated based upon water level within each well. 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. Influence from the pumping of the Bioreactor wells B3-EXW01 through B3-EXW05 is manifested as a "cone 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 the retard the flow of the groundwater away from the site that cannot be directly captured by the extraction wells. Off-post water supply wells along Ralph Fair Road may also exert a subtle influence to gradients along the western and southern boundaries of the post.

# Table 2.1
# Measured Groundwater Elevation
# September 2014

| 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 | 296.10 | 873.17 | X | | | 9/2/2014 |
| **CS-2** | **1237.59** | **258.29** | **979.30** | X | ? | | 9/2/2014 |
| CS-3 | 1240.17 | 267.75 | 972.42 | X | | | 9/2/2014 |
| CS-4 | 1229.28 | 254.72 | 974.56 | X | | | 9/2/2014 |
| **CS-9** | **1325.31** | **384.49** | **940.82** | **ALL** | | | 9/2/2014 |
| **CS-10** | **1331.51** | **386.48** | **945.03** | **ALL** | | | 9/2/2014 |
| **CS-12** | **1274.09** | **304.80** | **969.29** | **ALL** | | | 9/2/2014 |
| **CS-13** | **1193.26** | **287.47** | **905.79** | **ALL** | | | 9/2/2014 |
| CS-D | 1236.03 | 264.69 | 971.34 | X | | | 9/2/2014 |
| CS-MWG-LGR | 1328.14 | 322.86 | 1005.28 | X | | | 9/2/2014 |
| CS-MWH-LGR | 1319.19 | 311.95 | 1007.24 | X | | | 9/2/2014 |
| CS-I | 1315.20 | 314.80 | 1000.40 | X | | | 9/2/2014 |
| CS-MW1-LGR | 1220.73 | 253.06 | 967.67 | X | | | 9/2/2014 |
| CS-MW1-BS | 1221.09 | 247.78 | 973.31 | | X | | 9/2/2014 |
| CS-MW1-CC | 1221.39 | 288.67 | 932.72 | | | X | 9/2/2014 |
| CS-MW2-LGR | 1237.08 | 272.49 | 964.59 | X | | | 9/2/2014 |
| CS-MW2-CC | 1240.11 | 308.77 | 931.34 | | | X | 9/2/2014 |
| CS-MW3-LGR | 1334.14 | 360.59 | 973.55 | X | | | 9/2/2014 |
| CS-MW4-LGR | 1209.71 | 249.41 | 960.30 | X | | | 9/2/2014 |
| CS-MW5-LGR | 1340.24 | 378.92 | 961.32 | X | | | 9/2/2014 |
| CS-MW6-LGR | 1232.25 | 306.78 | 925.47 | X | | | 9/2/2014 |
| CS-MW6-BS | 1232.67 | 279.02 | 953.65 | | X | | 9/2/2014 |
| CS-MW6-CC | 1233.21 | 326.56 | 906.65 | | | X | 9/2/2014 |
| CS-MW7-LGR | 1202.27 | 287.57 | 914.70 | X | | | 9/2/2014 |
| CS-MW7-CC | 1201.84 | 305.22 | 896.62 | | | X | 9/2/2014 |
| CS-MW8-LGR | 1208.35 | 290.52 | 917.83 | X | | | 9/2/2014 |
| CS-MW8-CC | 1206.13 | 307.78 | 898.35 | | | X | 9/2/2014 |
| CS-MW9-LGR | 1257.27 | 273.95 | 983.32 | X | | | 9/2/2014 |
| CS-MW9-BS | 1256.73 | 272.64 | 984.09 | | X | | 9/2/2014 |
| CS-MW9-CC | 1255.95 | 308.04 | 947.91 | | | X | 9/2/2014 |
| CS-MW10-LGR | 1189.53 | 306.36 | 883.17 | X | | | 9/2/2014 |
| CS-MW10-CC | 1190.04 | 314.26 | 875.78 | | | X | 9/2/2014 |
| CS-MW11A-LGR | 1204.03 | 325.46 | 878.57 | X | | | 9/2/2014 |
| CS-MW11B-LGR | 1203.52 | Dry | Dry | X | | | 9/2/2014 |
| CS-MW12-LGR | 1259.07 | 292.69 | 966.38 | X | | | 9/2/2014 |
| CS-MW12-BS | 1258.37 | 287.44 | 970.93 | | X | | 9/2/2014 |
| CS-MW12-CC | 1257.31 | 314.33 | 942.98 | | | X | 9/2/2014 |
| CS-MW16-LGR | 1244.60 | 279.97 | 964.63 | X | | | 9/2/2014 |
| CS-MW16-CC* | 1244.51 | 379.98 | 864.53 | | | X | 9/2/2014 |
| B3-EXW01* | 1245.26 | 319.05 | 926.21 | X | | | 9/2/2014 |
| B3-EXW02 | 1249.66 | 282.89 | 966.77 | X | | | 9/2/2014 |
| B3-EXW03* | 1235.11 | 290.74 | 944.37 | X | | | 9/2/2014 |
| B3-EXW04 | 1228.46 | 310.50 | 917.96 | X | | | 9/2/2014 |
| B3-EXW05 | 1279.46 | 311.42 | 968.04 | X | | | 9/2/2014 |
| CS-MW17-LGR | 1257.01 | 322.80 | 934.21 | X | | | 9/2/2014 |
| CS-MW18-LGR | 1283.61 | 348.55 | 935.06 | X | | | 9/2/2014 |
| CS-MW19-LGR | 1255.53 | 306.26 | 949.27 | X | | | 9/2/2014 |
| CS-MW20-LGR | 1209.42 | 260.40 | 949.02 | X | | | 9/2/2014 |
| CS-MW21-LGR | 1184.53 | 252.42 | 932.11 | X | | | 9/2/2014 |
| CS-MW22-LGR | 1280.49 | 370.09 | 910.40 | X | | | 9/2/2014 |
| CS-MW23-LGR | 1258.20 | 346.56 | 911.64 | X | | | 9/2/2014 |
| CS-MW24-LGR | 1253.90 | 277.62 | 976.28 | X | | | 9/2/2014 |
| CS-MW25-LGR | 1293.01 | 313.45 | 979.56 | X | | | 9/2/2014 |
| CS-MW35-LGR | 1186.97 | 304.62 | 882.35 | X | | | 9/2/2014 |
| CS-MW36-LGR | 1218.74 | 297.91 | 920.83 | X | | | 9/2/2014 |
| **FO-20** | **NA** | **NA** | **1033.13** | **ALL** | | | 9/2/2014 |
| Number of wells screened in each formation. | | | | **38** | **4** | **9** | |
| Average groundwater elevation in each formation given in feet (non pumping wells). | | | | **947.85** | **970.50** | **916.54** | |

**Notes:**

**Bold wells**: 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
## September 2014

| Well ID | June 2014 Elevations | Sept. 2014 Elevations | GW elevation change (Sept. minus June) | Formations Screened | | |
|---|---|---|---|---|---|---|
| | | | | LGR | BS | CC |
| CS-1 | 900.27 | 873.17 | -27.10 | X | | |
| **CS-2** | **980.85** | **979.30** | **-1.55** | X | ? | |
| CS-3 | 983.12 | 972.42 | -10.70 | X | | |
| CS-4 | 981.00 | 974.56 | -6.44 | X | | |
| **CS-9** | **953.16** | **940.82** | **-12.34** | **ALL** | | |
| **CS-10** | **961.91** | **945.03** | **-16.88** | **ALL** | | |
| **CS-12** | **993.19** | **969.29** | **-23.90** | **ALL** | | |
| **CS-13** | **948.39** | **905.79** | **-42.60** | **ALL** | | |
| CS-D | 982.23 | 971.34 | -10.89 | X | | |
| CS-MWG-LGR | 1014.81 | 1005.28 | -9.53 | X | | |
| CS-MWH-LGR | 1015.92 | 1007.24 | -8.68 | X | | |
| CS-I | 1014.58 | 1000.40 | -14.18 | X | | |
| CS-MW1-LGR | 985.03 | 967.67 | -17.36 | X | | |
| CS-MW1-BS | 977.93 | 973.31 | -4.62 | | X | |
| CS-MW1-CC | 975.89 | 932.72 | -43.17 | | | X |
| CS-MW2-LGR | 984.84 | 964.59 | -20.25 | X | | |
| CS-MW2-CC | 965.41 | 931.34 | -34.07 | | | X |
| CS-MW3-LGR | 982.42 | 973.55 | -8.87 | X | | |
| CS-MW4-LGR | 1032.23 | 960.30 | -71.93 | X | | |
| CS-MW5-LGR | 979.83 | 961.32 | -18.51 | X | | |
| CS-MW6-LGR | 961.69 | 925.47 | -36.22 | X | | |
| CS-MW6-BS | 970.68 | 953.65 | -17.03 | | X | |
| CS-MW6-CC | 961.47 | 906.65 | -54.82 | | | X |
| CS-MW7-LGR | 951.02 | 914.70 | -36.32 | X | | |
| CS-MW7-CC | 950.89 | 896.62 | -54.27 | | | X |
| CS-MW8-LGR | 962.15 | 917.83 | -44.32 | X | | |
| CS-MW8-CC | 953.26 | 898.35 | -54.91 | | | X |
| CS-MW9-LGR | 989.41 | 983.32 | -6.09 | X | | |
| CS-MW9-BS | 1001.67 | 984.09 | -17.58 | | X | |
| CS-MW9-CC | 983.75 | 947.91 | -35.84 | | | X |
| CS-MW10-LGR | 931.81 | 883.17 | -48.64 | X | | |
| CS-MW10-CC | 915.29 | 875.78 | -39.51 | | | X |
| CS-MW11A-LGR | 937.24 | 878.57 | -58.67 | X | | |
| CS-MW11B-LGR | Dry | Dry | NA | X | | |
| CS-MW12-LGR | 979.64 | 966.38 | -13.26 | X | | |
| CS-MW12-BS | 986.14 | 970.93 | -15.21 | | X | |
| CS-MW12-CC | 980.55 | 942.98 | -37.57 | | | X |
| CS-MW16-LGR | 982.76 | 964.63 | -18.13 | X | | |
| CS-MW16-CC* | 976.71 | 864.53 | -112.18 | | | X |
| B3-EXW01* | 926.00 | 926.21 | 0.21 | X | | |
| B3-EXW02 | 950.12 | 966.77 | 16.65 | X | | |
| B3-EXW03* | 977.72 | 944.37 | -33.35 | X | | |
| B3-EXW04 | 984.81 | 917.96 | -66.85 | X | | |
| B3-EXW05 | 934.56 | 968.04 | 33.48 | X | | |
| CS-MW17-LGR | 954.88 | 934.21 | -20.67 | X | | |
| CS-MW18-LGR | 948.92 | 935.06 | -13.86 | X | | |
| CS-MW19-LGR | 977.06 | 949.27 | -27.79 | X | | |
| CS-MW20-LGR | 986.80 | 949.02 | -37.78 | X | | |
| CS-MW21-LGR | 945.83 | 932.11 | -13.72 | X | | |
| CS-MW22-LGR | 934.62 | 910.40 | -24.22 | X | | |
| CS-MW23-LGR | 942.08 | 911.64 | -30.44 | X | | |
| CS-MW24-LGR | 982.78 | 976.28 | -6.50 | X | | |
| CS-MW25-LGR | 985.29 | 979.56 | -5.73 | X | | |
| CS-MW35-LGR | 933.92 | 882.35 | -51.57 | X | | |
| CS-MW36-LGR | 963.47 | 920.83 | -42.64 | X | | |
| **FO-20** | **1050.16** | **1033.13** | **-17.03** | **ALL** | | |
| Average groundwater elevation change (all wells minus pumping wells) | | | **-26.88** | | | |
| Average groundwater elevation change in each formation (non pumping wells) | | | | **-24.25** | **-13.61** | **-44.27** |

**Notes:**

**Bold wells**: 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.

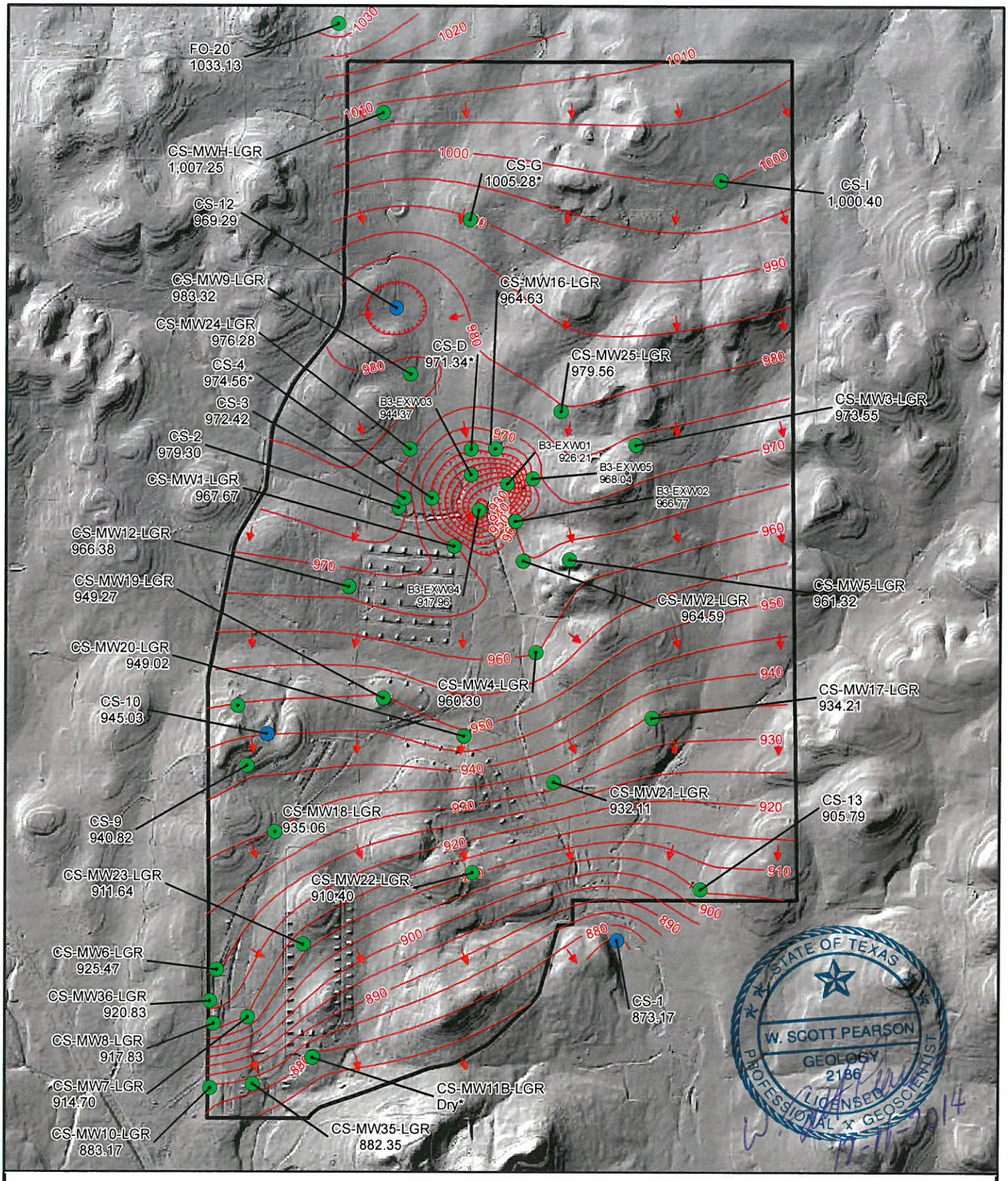
CS-MW16-LGR, CS-MW16-CC, B3-EXW01 through B3-EXW05 pumps are cycling continuously to feed the B-3 Bioreactor.

* = 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




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

# Figure 2.1

## September 2014 Potentiometric Surface Map, LGR Wells

## Camp Stanley Storage Activity

PARSONS

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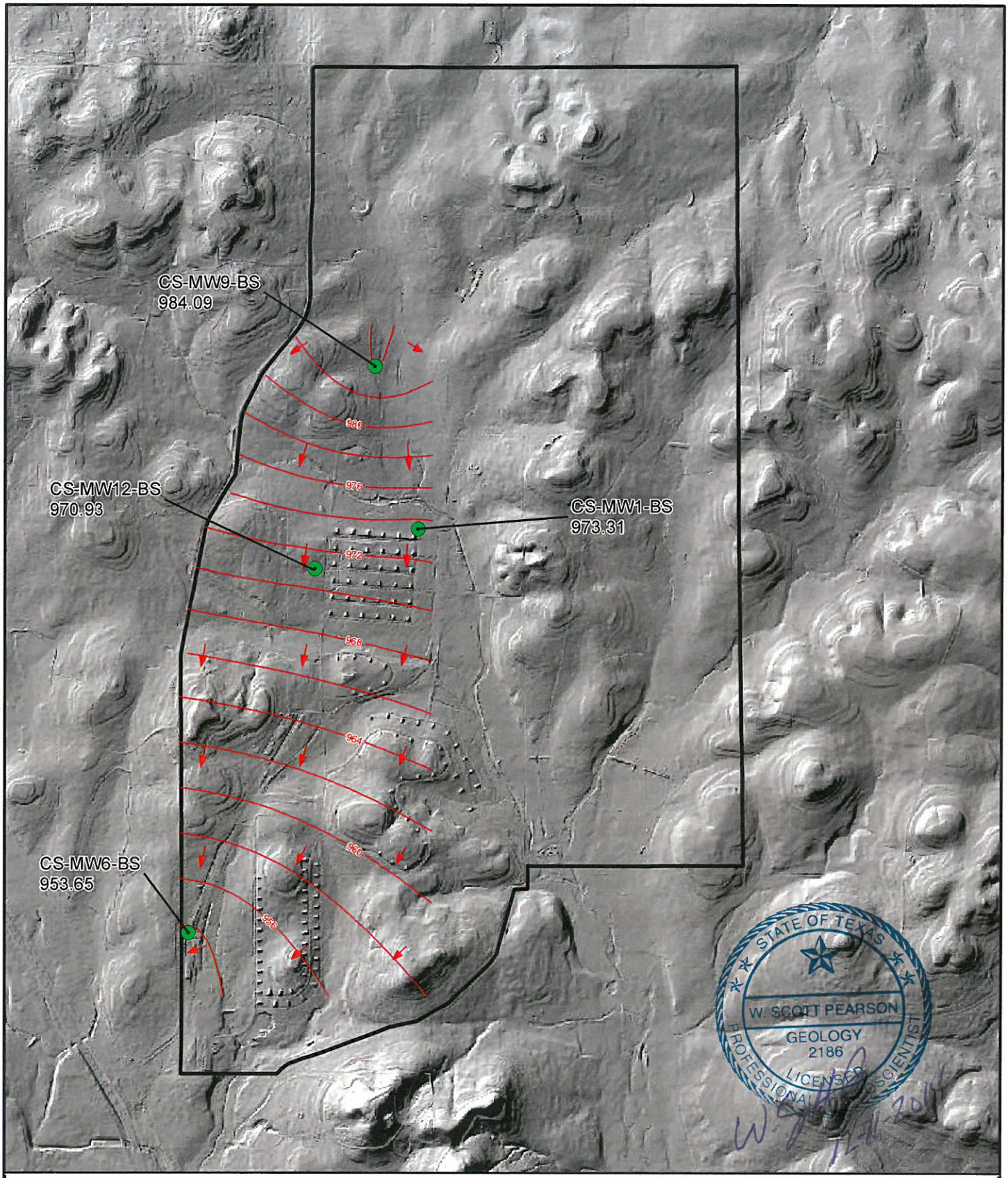


Figure 2.2

September 2014 Potentiometric Surface Map, BS Wells

Camp Stanley Storage Activity

PARSONS

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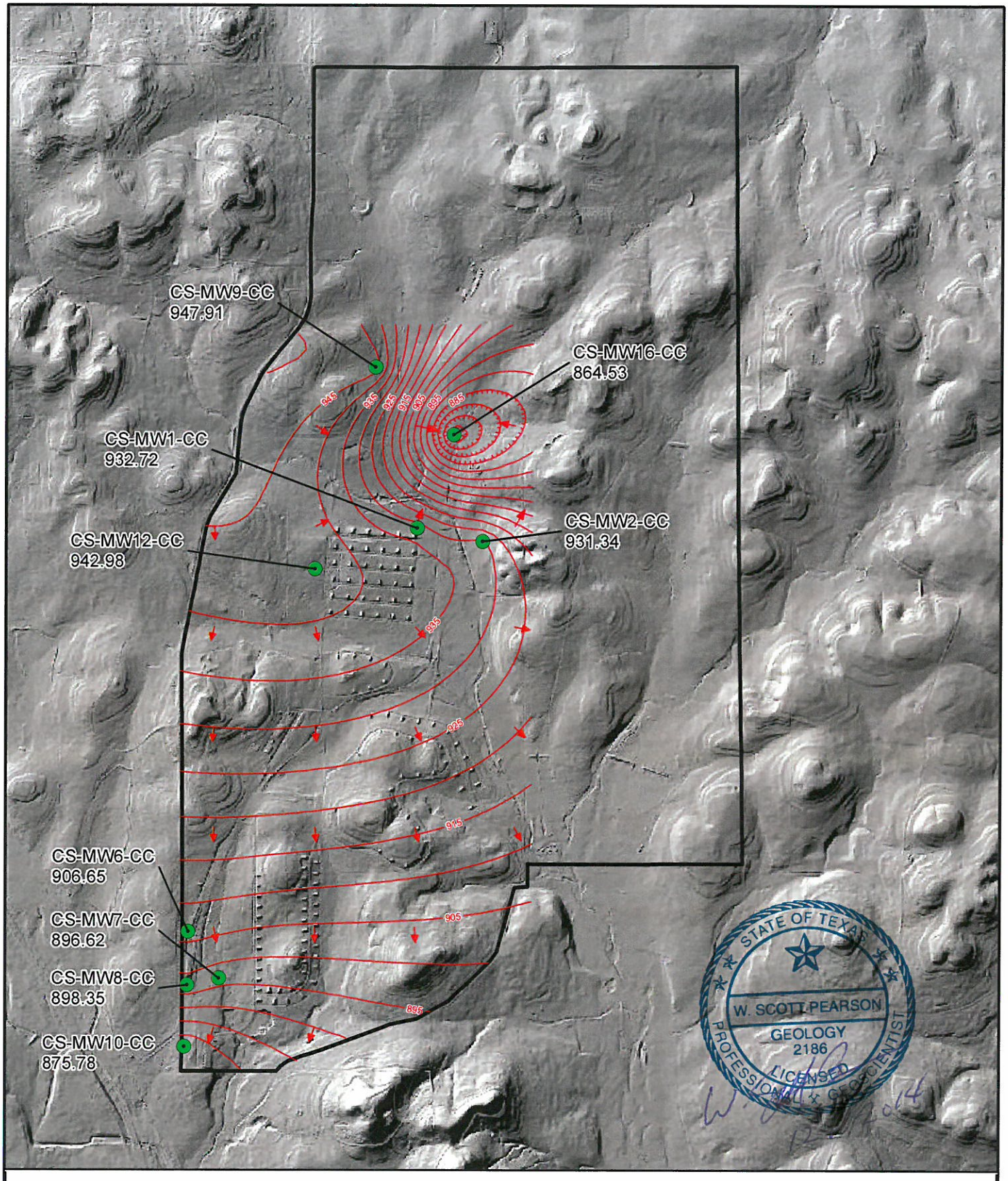


Figure 2.3

September 2014 Potentiometric Surface Map, CC Wells

Camp Stanley Storage Activity

PARSONS

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Historical groundwater monitoring at CSSA has demonstrated that the aquifer gradient typically slopes in a south-southeast direction (**Figure 2.1**). However, variable aquifer levels and well-pumping scenarios all can affect the localized and regional gradients. In particular, pumping action at wells CS-1, CS-10, CS-MW16-LGR/CC, B3-EXW01 through B3-EXW05, 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 measured from CS-MWH-LGR to CS-MW21-LGR. For September 2014, the overall LGR groundwater gradient is to the south-southeast at 0.0055 ft/ft.

The potentiometric surface in both the BS and CC members of the aquifer generally trend in a southerly direction as well (**Figures 2.2 and 2.3**). In **Figure 2.3**, the cone of depression within the CC segment of the aquifer is clearly evident from the pumping action of CS-MW16-CC at the Bioreactor system. The pumping action of this single well disrupts the regional flow pattern within the CC segment, and incurs measurable drawdown in well CS-MW1-CC at a distance of nearly 2,000 feet.

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 2013, and continuing into 2014. A paucity of rainfall between July and September 2014 (approximately 5 inches) resulted in approximately 27 feet of aquifer level loss in the MW-LGR series wells. These wells are exclusively screened across the basal portion of the LGR, and are used as a baseline for quarterly comparisons. In September 2014, the basewide average level in these wells was 942 feet MSL. This is consistent with the average "marker" elevation (944 feet MSL) at which the aquifer decline will plateau within the basal production interval of the LGR, but yield continues to decrease. The aquifer level as measured in the LGR-screened wells is 83 feet below the 11.75-year average of 1,025 ft MSL, and is the lowest average LGR level for the period of record. The LGR has not been above the long-term "average" water elevation since December 2010.

# 3.0 SEPTEMBER 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 September 2014 included 14 wells. The samples included three production wells (CS-1, CS-10, and CS-12), one future production well (CS-13), and 10 on-post monitoring wells (see **Table 3.1)**. Three wells were not sampled in September 2014. Wells CS-MW10-LGR, CS-4, and CS-D were not sampled due to the water level falling below the sampling pump. 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. Five additional wells were added (CS-MW1-CC, CS-MW2-CC, CS-MW4-LGR, CS-MW17-LGR, and CS-MW21-LGR) to gather data for an upcoming TCEQ requirement for future drinking water well CS-13. Three of those wells (CS-MW2-CC, CS-MW4-LGR, and CS-MW17-LGR) were not sampled due to the water level falling below the sampling pump. **Tables 3.1** and **3.2** provide a sampling overview for September 2014 and the schedule under the LTMO recommendations. The above-listed monitoring wells were sampled using dedicated low-flow gas-operated bladder pumps. Wells CS-1, CS-10, CS-12, and CS-13 were sampled using dedicated submersible pumps. Westbay Wells WB01 through WB04 were not sampled this quarter in accordance with the project DQOs. However profile data was collected to assess water levels in the area. **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 September 2014 for the short list of volatile organic compounds (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 VOCs and metals (arsenic, barium, chromium, copper, zinc, cadmium, mercury, and lead).

Samples were analyzed by Agriculture & Priority Pollutant Laboratory (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**.

Tetrachloroethene (PCE) and/or Trichloroethene (TCE) were detected above the Maximum Contaminant Level (MCL) in two on-post wells sampled this quarter, CS-MW1-LGR and CS-MW36-LGR. A comparison of VOC concentrations versus water level for select wells is presented in **Figure 3.2**. The overall trend for wells sampled in September 2014 (CS-MW1-LGR and CS-MW36-LGR) was a slight increase in VOC concentrations with a moderate decrease in groundwater elevation. In September 2014, no metals were detected above the MCL/AL/SS for wells sampled.

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 749138-#55, -#57, -#60, containing the analytical results from this sampling event, were received by Parsons October 2 through 10, 2014. 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* | *Mar-14* | *Jun-14 (18 mo. snapshot)* | *Sep-14* | *Sampling Frequency ** |
|---|---|---|---|---|---|---|---|
| 1 | CS-MW1-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | S | S | S | Semi-annual + 9 month snapshot |
| | CS-MW1-BS | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NS | NS | NS | sampled on an as needed basis |
| added | CS-MW1-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| 2 | CS-MW2-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Mar-14 | S | S | S | Semi-annual + 9 month snapshot |
| added | CS-MW2-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| | CS-MW3-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| added | CS-MW4-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-13 | NS | NSWL | NS | Every 9 months |
| | CS-MW5-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | Jun-14 | S | NS | Every 9 months |
| ISCO | CS-MW6-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW6-BS | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NS | NS | NS | sampled on an as needed basis |
| | CS-MW6-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| ISCO | CS-MW7-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW7-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| 3 / ISCO | CS-MW8-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | S | S | S | Semi-annual + 9 month snapshot |
| | CS-MW8-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| | CS-MW9-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW9-BS | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NS | NS | NS | sampled on an as needed basis |
| | CS-MW9-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| 4 | CS-MW10-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NSWL | S | S | Semi-annual + 9 month snapshot |
| | CS-MW10-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NS | NSWL | NS | Every 18 months |
| 5 | CS-MW11A-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | S | S | S | Semi-annual + 9 month snapshot |
| | CS-MW11B-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Mar-12 | NS | NSWL | NS | Every 9 months |
| | CS-MW12-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW12-BS | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NS | NS | NS | sampled on an as needed basis |
| | CS-MW12-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| | CS-MW16-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW16-CC | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| added | CW-MW17-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW18-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NS | NSWL | NS | Every 9 months |
| | CS-MW19-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| 6 | CS-1 | VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn) | Jun-14 | S | S | S | Quarterly |
| | CS-2 | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| 7 | CS-4 | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-13 | NSWL | NSWL | S | Semi-annual + 9 month snapshot |
| | CS-9 | VOCs & metals (Cr, Cd, Hg, Pb) | Sep-13 | NS (pump outage) | NS | NS | pump out |
| 8 | CS-10 | VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn) | Jun-14 | S | S | S | Quarterly |
| 9 | CS-12 | VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn) | Jun-14 | S | S | S | Quarterly |
| 10 | CS-13 | VOCs & metals (As,Ba,Cr, Cu,Cd,Hg,Pb,Zn) | Jun-14 | NS | S | S | installtion in progress |
| 11 | CS-D | VOCs & metals (Cr, Cd, Hg, Pb) | Dec-12 | NSWL | NSWL | S | Semi-annual + 9 month snapshot |
| | CS-MWG-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| | CS-MWH-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| | CS-I | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 18 months |
| | CS-MW20-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| added | CS-MW21-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW22-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| | CS-MW23-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| 12 | CS-MW24-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | S | S | S | Semi-annual + 9 month snapshot |
| | CS-MW25-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | NS | S | NS | Every 9 months |
| 13 | CS-MW35-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | S | S | S | Semi-annual + 9 month snapshot |
| 14/ISCO | CS-MW36-LGR | VOCs & metals (Cr, Cd, Hg, Pb) | Jun-14 | S | S | S | Quarterly |

* New LTMO sampling frequency implemented June 2011

S = Sample

NS = No Sample

NSWL = No Sample due to low water level

J:\CSSA Program\Restoration\Groundwater\GW Monitoring Reports\2014\on-post\Sept\Table 3-1 and 3-2 GW sample counts.xlsx

**Table 3.2 Westbay Sampling Frequency**

| Westbay Interval | Last Sample Date | Mar-14 (18 month) | Jun-14 (snapshot) | Sep-14 | LTMO Sampling Frequency (as of June '11) | ISCO Sampling Locations |
|---|---|---|---|---|---|---|
| CS-WB01-UGR-01 | Dec-04 | NSWL | NS | NS | Every 9 months | S |
| CS-WB01-LGR-01 | Jun-13 | S | NS | NS | Every 9 months | S |
| CS-WB01-LGR-02 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-03 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-04 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-05 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-06 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-07 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-08 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB01-LGR-09 | Sep-13 | S | S | NS | Every 9 months + snapshot | S |
| CS-WB02-UGR-01 | Dec-04 | NSWL | NS | NS | Every 9 months | S |
| CS-WB02-LGR-01 | Jun-13 | NSWL | NS | NS | Every 9 months | S |
| CS-WB02-LGR-02 | Mar-10 | NSWL | NS | NS | Every 9 months | |
| CS-WB02-LGR-03 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB02-LGR-04 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB02-LGR-05 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB02-LGR-06 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB02-LGR-07 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB02-LGR-08 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB02-LGR-09 | Sep-13 | S | S | NS | Every 9 months + snapshot | S |
| CS-WB03-UGR-01 | Jun-13 | S | NS | NS | Every 9 months | S |
| CS-WB03-LGR-01 | Sep-10 | S | NS | NS | Every 9 months | S |
| CS-WB03-LGR-02 | Oct-07 | NSWL | NS | NS | Every 9 months | |
| CS-WB03-LGR-03 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB03-LGR-04 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB03-LGR-05 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB03-LGR-06 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB03-LGR-07 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB03-LGR-08 | Jun-13 | S | NS | NS | Every 9 months | |
| CS-WB03-LGR-09 | Sep-13 | S | S | NS | Every 9 months + snapshot | S |
| CS-WB04-UGR-01 | Mar-04 | NSWL | NS | NS | Every 9 months | S |
| CS-WB04-LGR-01 | Sep-12 | S | NS | NS | Every 18 months | S |
| CS-WB04-LGR-02 | Mar-10 | NSWL | NS | NS | Every 18 months | |
| CS-WB04-LGR-03 | Sep-12 | S | NS | NS | Every 18 months | |
| CS-WB04-LGR-04 | Sep-12 | S | NS | NS | Every 18 months | |
| CS-WB04-LGR-06 | Sep-13 | S | S | NS | Every 9 months + snapshot | |
| CS-WB04-LGR-07 | Sep-13 | S | S | NS | Every 9 months + snapshot | |
| CS-WB04-LGR-08 | Sep-12 | S | NS | NS | Every 9 months | |
| CS-WB04-LGR-09 | Sep-13 | S | S | NS | Every 9 months + snapshot | |
| CS-WB04-LGR-10 | Sep-13 | S | S | NS | Every 9 months + snapshot | |
| CS-WB04-LGR-11 | Sep-13 | S | S | NS | Every 9 months + snapshot | S |
| CS-WB04-BS-01 | Sep-12 | S | NS | NS | Every 18 months | |
| CS-WB04-BS-02 | Sep-12 | S | NS | NS | Every 18 months | |
| CS-WB04-CC-01 | Sep-12 | S | NS | NS | Every 18 months | |
| CS-WB04-CC-02 | Sep-12 | S | NS | NS | Every 18 months | |
| CS-WB04-CC-03 | Sep-12 | S | NS | NS | Every 18 months | |

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

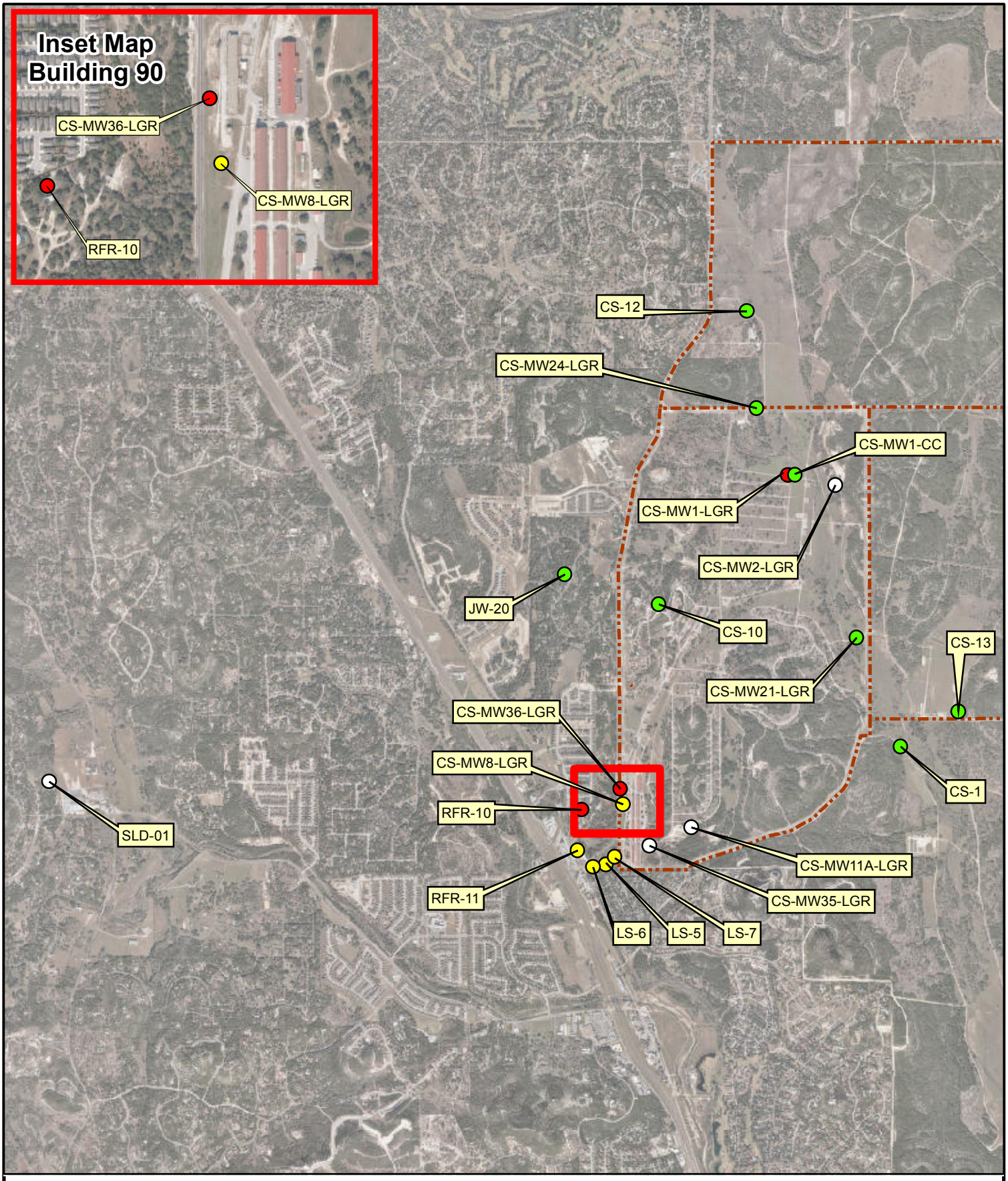



Figure 3.1

On-Post and Off-Post Well Sampling Locations for September 2014

Camp Stanley Storage Activity

PARSONS

**Table 3.3**
**September 2014 On-Post Quarterly Groundwater Results, Detected Analytes**

| Well ID | Sample Date | Arsenic | Barium | Cadmium | Chromium | Copper | Lead | Zinc | Mercury |
|---|---|---|---|---|---|---|---|---|---|
| CS-MW1-LGR | 9/8/2014 | NA | NA | -- | **0.0035F** | NA | -- | NA | -- |
| CS-MW1-LGR FD | 9/8/2014 | NA | NA | -- | **0.0037F** | NA | -- | NA | -- |
| CS-MW1-CC | 9/8/2014 | NA | NA | -- | **0.0011F** | NA | -- | NA | -- |
| CS-MW2-LGR | 9/8/2014 | NA | NA | -- | **0.0012F** | NA | -- | NA | -- |
| CS-MW8-LGR | 9/4/2014 | NA | NA | -- | **0.0016F** | NA | -- | NA | -- |
| CS-MW11A-LGR | 9/8/2014 | NA | NA | -- | **0.0041F** | NA | -- | NA | -- |
| CS-MW21-LGR | 9/8/2014 | NA | NA | -- | -- | NA | -- | NA | -- |
| CS-MW24-LGR | 9/8/2014 | NA | NA | -- | **0.0017F** | NA | -- | NA | -- |
| CS-MW35-LGR | 9/9/2014 | NA | NA | -- | **0.0020F** | NA | -- | NA | -- |
| CS-MW36-LGR | 9/9/2014 | NA | NA | -- | **0.0011F** | NA | -- | NA | -- |
| **CSSA Drinking Water Well System** | | | | | | | | | |
| CS-1 | 9/9/2014 | **0.0005F** | **0.0355** | -- | -- | -- | -- | **0.282** | -- |
| CS-10 | 9/17/2014 | **0.0021F** | **0.0385** | -- | -- | **0.016** | -- | **0.133** | -- |
| CS-12 | 9/9/2014 | **0.0008F** | **0.0313** | -- | -- | **0.004F** | -- | **0.08** | -- |
| CS-12 FD | 9/9/2014 | -- | **0.0316** | -- | -- | **0.006F** | -- | **0.077** | -- |
| CS-13 | 9/9/2014 | **0.0044F** | **0.0331** | -- | -- | -- | -- | **0.286** | -- |
| **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 | 1,1-DCE | *cis* -1,2-DCE | *trans* -1,2-DCE | PCE | TCE | Vinyl Chloride |
|---|---|---|---|---|---|---|---|
| CS-MW1-LGR | 9/8/2014 | -- | **43.51** | **0.69** | **27.16** | **33.75** | -- |
| CS-MW1-LGR FD | 9/8/2014 | -- | **45.9** | **0.67** | **28.46** | **36.51** | -- |
| CS-MW1-CC | 9/8/2014 | -- | -- | -- | -- | -- | -- |
| CS-MW2-LGR | 9/8/2014 | -- | **0.61F** | -- | -- | -- | -- |
| CS-MW8-LGR | 9/4/2014 | -- | -- | -- | **1.54** | -- | -- |
| CS-MW11A-LGR | 9/8/2014 | -- | -- | -- | **0.97F** | -- | -- |
| CS-MW21-LGR | 9/8/2014 | -- | -- | -- | -- | -- | -- |
| CS-MW24-LGR | 9/8/2014 | -- | -- | -- | -- | -- | -- |
| CS-MW35-LGR | 9/9/2014 | -- | -- | -- | **0.35F** | -- | -- |
| CS-MW36-LGR | 9/9/2014 | -- | **0.63F** | -- | **16.3** | **22.55** | -- |
| **CSSA Drinking Water Well System** | | | | | | | |
| CS-1 | 9/9/2014 | -- | -- | -- | -- | -- | -- |
| CS-10 | 9/17/2014 | -- | -- | -- | -- | -- | -- |
| CS-12 | 9/9/2014 | -- | -- | -- | -- | -- | -- |
| CS-12 FD | 9/9/2014 | -- | -- | -- | -- | -- | -- |
| CS-13 | 9/9/2014 | -- | -- | -- | -- | -- | -- |
| **Comparison Criteria** | | | | | | | |
| **Method Detection Limit (MDL)** | | **0.12** | **0.07** | **0.08** | **0.06** | **0.05** | **0.08** |
| **Reporting Limit (RL)** | | **1.2** | **1.2** | **0.6** | **1.4** | **1** | **1.1** |
| **Max. Contaminant Level (MCL)** | | **7** | **70** | **100** | **5** | **5** | **2** |

| | |
|---|---|
| **BOLD** | ≥ MDL |
| **BOLD** | ≥ RL |
| **BOLD** | ≥ MCL |

| Precipitation per Quarter (inches): | Mar-14 | Jun-14 | Sep-14 |
|---|---|---|---|
| Southern Weather Station AOC-65 | 1.1 | 8.03 | 5.09 |
| Northern Weather Station B-3 | 0.96 | 8.73 | 6.25 |

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

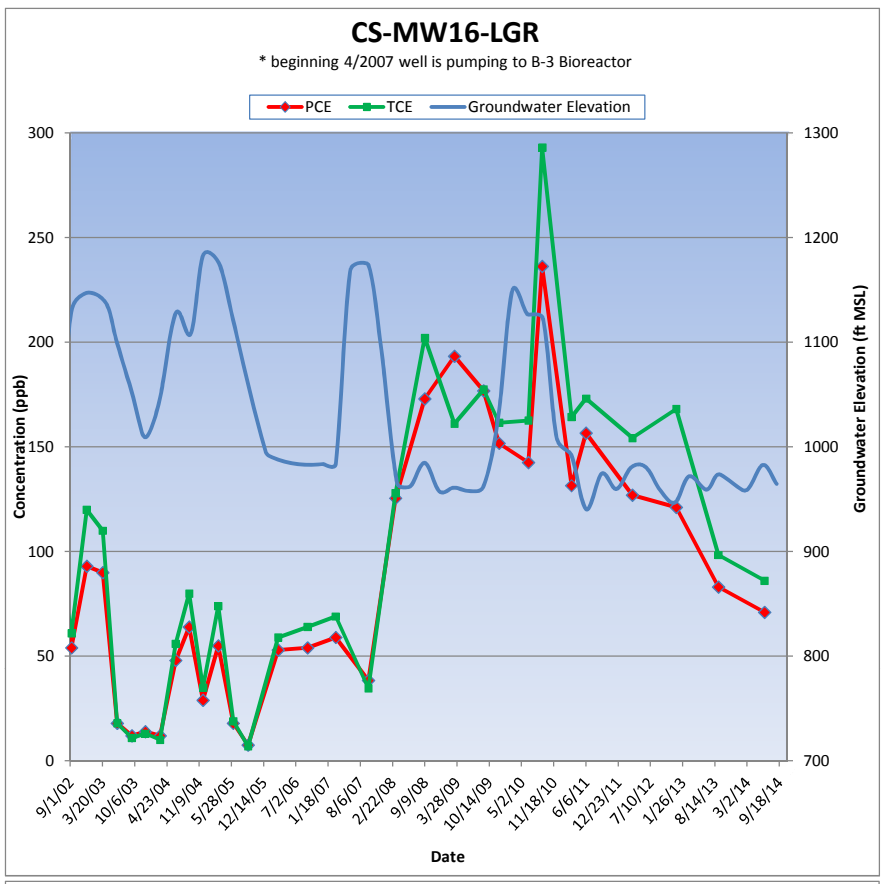
**Abbreviations/Notes:**

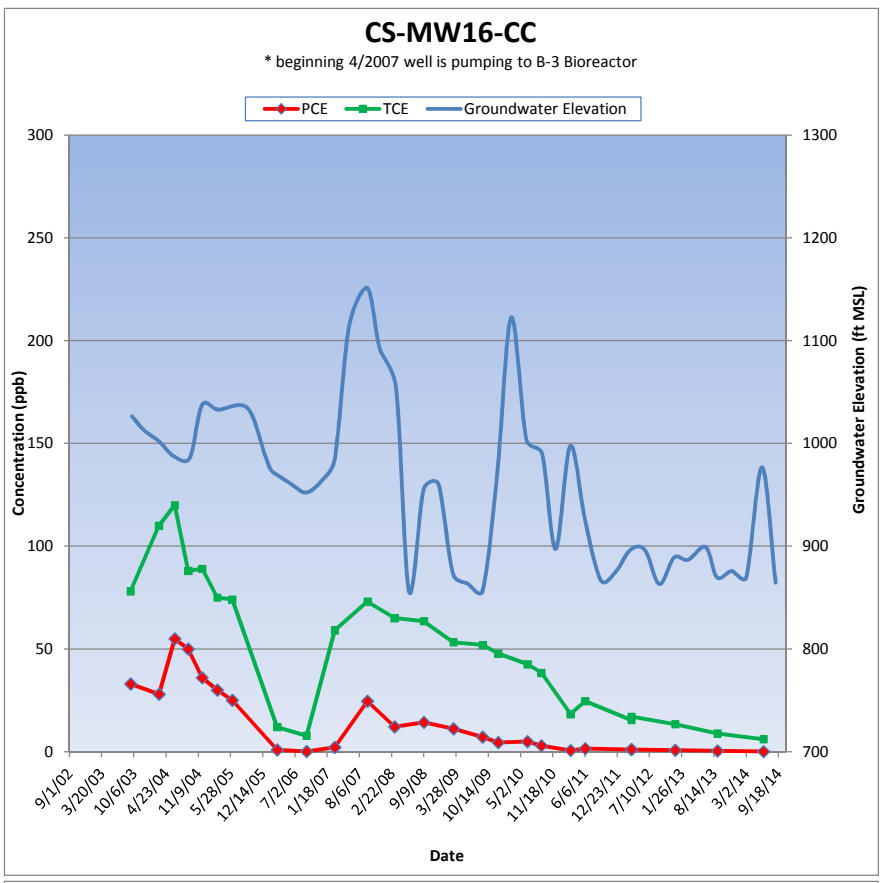
| | |
|---|---|
| FD | Field Duplicate |
| TCE | Trichloroethene |
| PCE | Tetrachloroethene |
| DCE | Dichloroethene |
| AL | Action Level |
| SS | Secondary Standard |
| NA | Not Analyzed for this parameter |

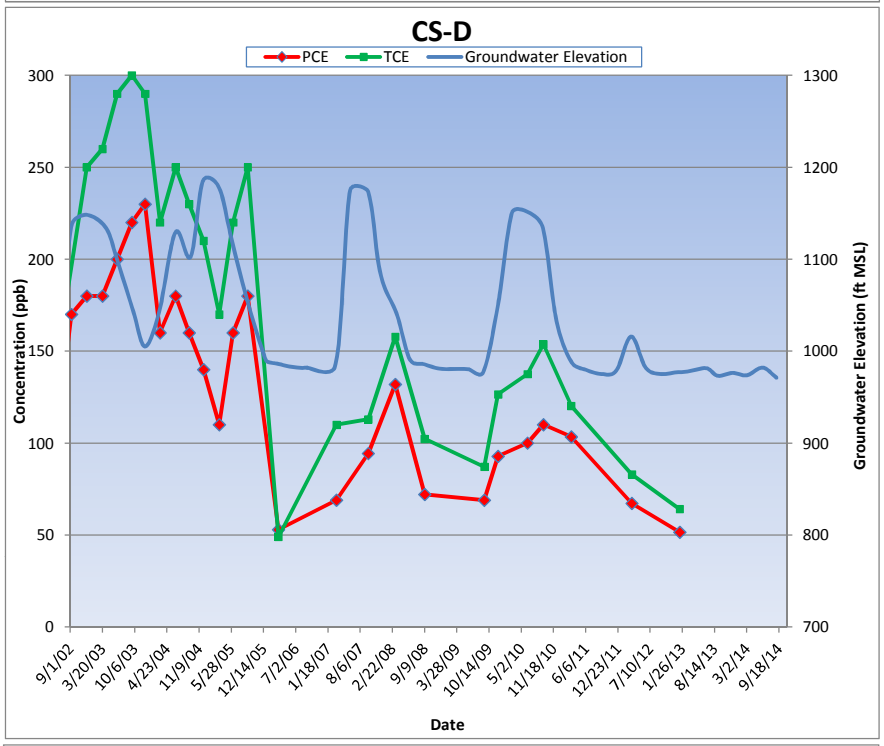
**Data Qualifiers:**

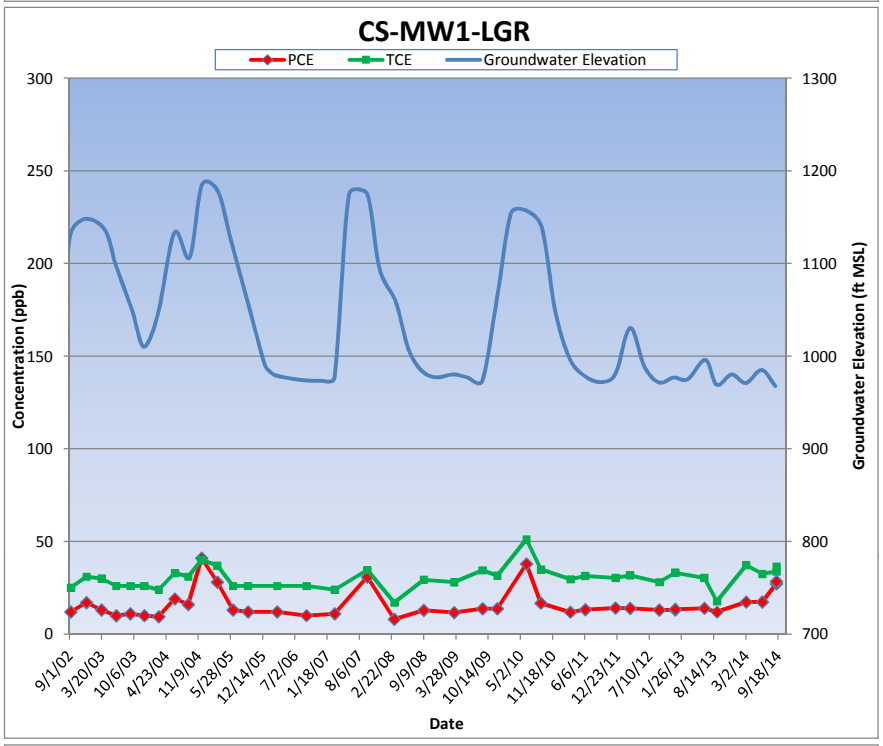
--The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.
F-The analyte was positively identified but the associated numerical value is below the RL.

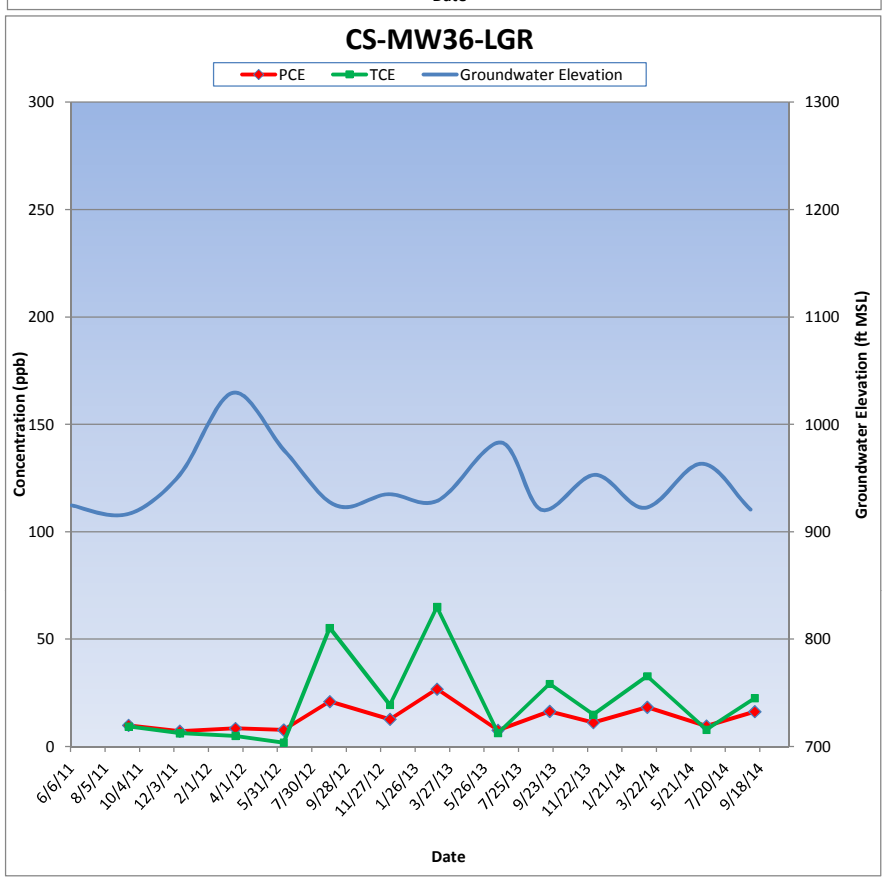
# Figure 3.2
# On-Post Cumulative Analytical vs. Groundwater Elevation

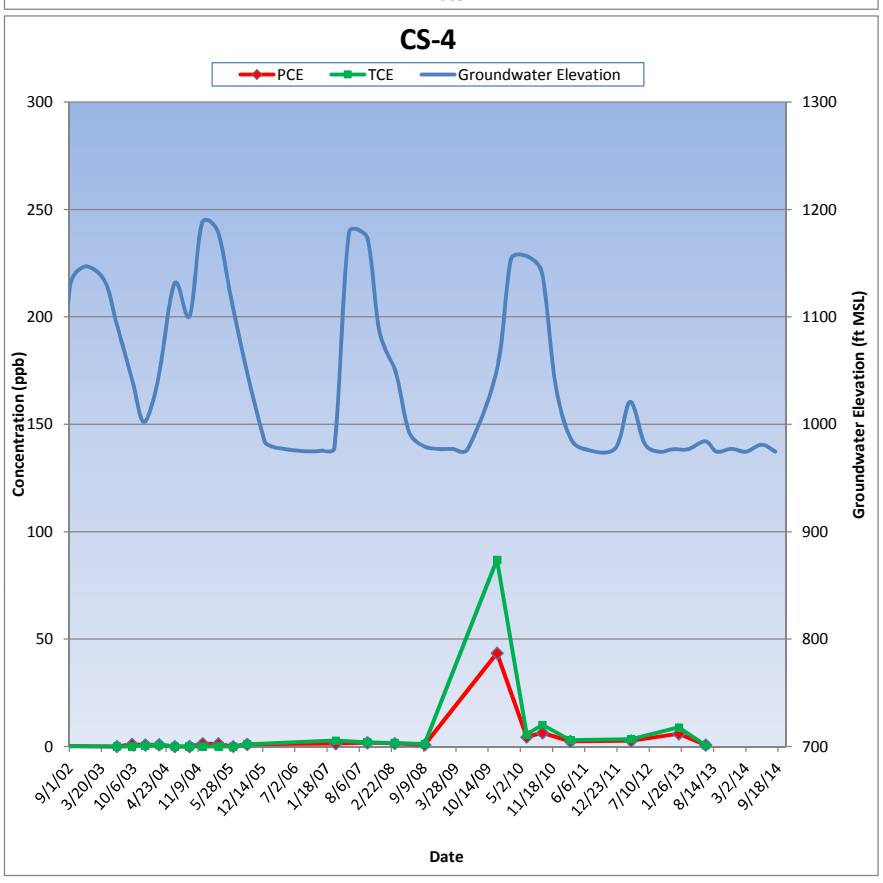



NOTE: Sampling dates are indicated by the squares on the trend line.

## 3.2 Westbay-equipped Wells

Under the provisions of the groundwater monitoring LTMO recommendations, no zones in the AOC-65 Westbay wells (CS-WB01, CS-WB02, CS-WB03, and CS-WB04) were scheduled for sampling in September 2014. However, these wells were profiled to capture water level readings. These Westbay wells are located in the vicinity of AOC-65, and are part of the basewide quarterly groundwater monitoring program. The Upper Glen Rose (UGR)/LGR zones are sampled on a 9-month schedule, and the BS/CC zones are sampled on an 18-month schedule, as recommended in the LTMO. The sampling of these wells began in September 2003.

Selected zones were sampled as part of the AOC-65 ISCO Treatability Study; these results will be reported in a separate treatability study report.

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 SEPTEMBER 2014 SUMMARY

- A total of nineteen wells were planned to be sampled in September 2014. Fourteen wells are part of the approved LTMO schedule, while five wells were added as part of the well CS-13 monitoring program in accordance with the TCEQ. As such, six of these wells (CS-MW2-CC, CS-MW4-LGR, CS-MW10-LGR, CS-MW17-LGR, CS-4, and CS-D) were not sampled due to water levels falling below the pump.
- From June 27 to September 17, 2014, CSSA's AOC-65 weather station recorded 5.09 inches of rain. The rainfall was sporadic with a majority of the rain falling in September, 3.31 inches. One event had greater than one inch of rain, 1.62, on July 18th. The SWMU B-3 weather station measured 6.25 inches of precipitation for the same time period. This is a slight decrease in quarterly rainfall from last quarter which measured 8.03 inches at AOC-65 and 8.73 inches at B-3.
- Water levels decreased an average of 26.88 feet per non-pumping wells since last quarter. The average water level in September 2014 (excluding pumping wells) was 298.52 feet BTOC (943.95 feet MSL).
- VOCs were detected above the MCL in wells CS-MW1-LGR and CS-MW36-LGR. The VOC levels in CS-MW36-LGR increased slightly from the previous sampling event. The TCE level in CS-MW1-LGR increased slightly from last quarter; however, the levels of PCE, *cis*-1,2-DCE, and *tran*-1,2-DCE showed a notable increase to levels not seen since June 2010 **(see Figure 3.2)**.
- There were no metals detected above the MCL/AL/SS in wells sampled in September 2014.
- The 4 Westbay Wells (WB01-WB04) in the vicinity of AOC-65 were not sampled in September 2014. However, these wells were profiled to collect water level data in the area. All LGR zones included in the 9 month schedule, in accordance with the DQOs and LTMO, will be sampled in December 2014.
- It should be noted that an ISCO injection was performed at AOC-65 September 22nd through November 6th. This included the application of approximately 100,000 gallons of chemical oxidants (activated persulfate solution) within the AOC-65 infiltration gallery to destroy contaminants. Once applied, the oxidant solution follows similar subsurface flow paths as contaminants and precipitation, destroying and releasing contaminants encountered (including PCE) from the host rock until the solution reactivity has been consumed. Contaminants mobilized from the host rock during this process are more readily transported downgradient following significant rain events when the flow paths are saturated.
- The groundwater project DQOs and LTMO, last revised in 2010, are scheduled to be updated in 2015.

# 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 September 2, 2014. | 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 September 2, 2014 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-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 & B-3 weather stations. Water levels will be graphed at these wells against precipitation data through December 2014 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 13 of 49 CSSA wells. Wells CS-MW2-CC, CS-MW4-LGR, CS-MW10-LGR, CS-MW17-LGR, CS-4, and CS-D were not sampled due to the water level falling below the pump. 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-MW1-LGR, CS-MW1-CC, CS-MW2-LGR, CS-MW8-LGR, CS-MW11A-LGR, CS-MW21-LGR, CS-MW24-LGR, CS-MW35-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. | **ANALYTE** / **RL (µg /L)** / **MCL(µg/L)**<br>1,1-DCE 1.2 7<br>*cis*-1,2-DCE 1.2 70<br>*trans*-1,2-DCE 0.6 100<br>PCE 1.4 5<br>TCE 1.0 5<br>Vinyl chloride 1.1 2 | Yes. | Continue sampling. |
| | | **ANALYTE** / **RL (µg/L)** / **MCL/AL (µg /L)**<br>Barium 5 2,000<br>Chromium 10 100<br>Copper 10 1,300<br>Zinc 50 5,000<br>Arsenic 30 10<br>Cadmium 7 5<br>Lead 25 15<br>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 SEPTEMBER 2014

# Appendix B
## September 2014 Quarterly On-Post Groundwater Monitoring Analytical Results

| Well ID | Sample Date | Arsenic | Barium | Cadmium | Chromium | Copper | Lead | Zinc | Mercury |
|---|---|---|---|---|---|---|---|---|---|
| CS-MW1-LGR | 9/8/2014 | NA | NA | 0.0005U | **0.0035F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW1-LGR FD | 9/8/2014 | NA | NA | 0.0005U | **0.0037F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW1-CC | 9/8/2014 | NA | NA | 0.0005U | **0.0011F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW2-LGR | 9/8/2014 | NA | NA | 0.0005U | **0.0012F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW8-LGR | 9/4/2014 | NA | NA | 0.0005U | **0.0016F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW11A-LGR | 9/8/2014 | NA | NA | 0.0005U | **0.0041F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW21-LGR | 9/8/2014 | NA | NA | 0.0005U | 0.0010U | NA | 0.0019U | NA | 0.0001U |
| CS-MW24-LGR | 9/8/2014 | NA | NA | 0.0005U | **0.0017F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW35-LGR | 9/9/2014 | NA | NA | 0.0005U | **0.0020F** | NA | 0.0019U | NA | 0.0001U |
| CS-MW36-LGR | 9/9/2014 | NA | NA | 0.0005U | **0.0011F** | NA | 0.0019U | NA | 0.0001U |
| **CSSA Drinking Water Well System** | | | | | | | | | |
| CS-1 | 9/9/2014 | **0.0005F** | **0.0355** | 0.0005U | 0.0010U | 0.003U | 0.0019U | **0.282** | 0.0001U |
| CS-10 | 9/17/2014 | **0.0021F** | **0.0385** | 0.0005U | 0.0010U | **0.016** | 0.0019U | **0.133** | 0.0001U |
| CS-12 | 9/9/2014 | **0.0008F** | **0.0313** | 0.0005U | 0.0010U | **0.004F** | 0.0019U | **0.08** | 0.0001U |
| CS-12 FD | 9/9/2014 | 0.0002U | **0.0316** | 0.0005U | 0.0010U | **0.006F** | 0.0019U | **0.077** | 0.0001U |
| CS-13 | 9/9/2014 | **0.0044F** | **0.0331** | 0.0005U | 0.0010U | 0.003U | 0.0019U | **0.286** | 0.0001U |

| Well ID | Sample Date | 1,1-DCE | *cis* -1,2-DCE | *trans* -1,2-DCE | PCE | TCE | Vinyl Chloride |
|---|---|---|---|---|---|---|---|
| CS-MW1-LGR | 9/8/2014 | 0.12U | **43.51** | **0.69** | **27.16** | **33.75** | 0.08U |
| CS-MW1-LGR FD | 9/8/2014 | 0.12U | **45.9** | **0.67** | **28.46** | **36.51** | 0.08U |
| CS-MW1-CC | 9/8/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-MW2-LGR | 9/8/2014 | 0.12U | **0.61F** | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-MW8-LGR | 9/4/2014 | 0.12U | 0.07U | 0.08U | **1.54** | 0.05U | 0.08U |
| CS-MW11A-LGR | 9/8/2014 | 0.12U | 0.07U | 0.08U | **0.97F** | 0.05U | 0.08U |
| CS-MW21-LGR | 9/8/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-MW24-LGR | 9/8/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-MW35-LGR | 9/9/2014 | 0.12U | 0.07U | 0.08U | **0.35F** | 0.05U | 0.08U |
| CS-MW36-LGR | 9/9/2014 | 0.12U | **0.63F** | 0.08U | **16.3** | **22.55** | 0.08U |
| **CSSA Drinking Water Well System** | | | | | | | |
| CS-1 | 9/9/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-10 | 9/17/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-12 | 9/9/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-12 FD | 9/9/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |
| CS-13 | 9/9/2014 | 0.12U | 0.07U | 0.08U | 0.06U | 0.05U | 0.08U |

| | |
|---|---|
| **BOLD** | ≥ MDL |
| **BOLD** | ≥ RL |
| **BOLD** | ≥ 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 MDL.
F-The analyte was positively identified but the associated numerical value is below the RL.

# APPENDIX C

# DATA VALIDATION REPORT

## SDG 74230
## SDG 74243
## SDG 74344

**DATA VERIFICATION SUMMARY REPORT**

**for on- and off-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 groundwater samples and the associated field quality control (QC) sample collected from on-post and off-post Camp Stanley Storage Activity (CSSA) on September 3 and 4, 2014. The samples were assigned to the following Sample Delivery Group (SDG). The on-post sample was analyzed for volatile organic compounds (VOCs) and metals including cadmium, chromium, lead, and mercury. All off-post samples were analyzed for VOCs only.

74230

The field QC samples associated with this SDG were a set of parent/field duplicate (FD) and a 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. The samples in this SDG were shipped to the laboratory in one cooler. The cooler was received by the laboratory at a temperature of 4.0ºC, which was within the 2-6ºC 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 sixteen (16) samples, including one (1) on-post groundwater sample, thirteen (13) off-post groundwater samples, one (1) FD, and one (1) TB. All samples were collected on September 3 and 4, 2014 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 batch (#189914B) 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 was evaluated based on the relative percent difference (%RPD) of parent/FD results. Sample JW-20 was collected in duplicate. All results were non-detect at or above the reporting limit so %RPD calculations were not applicable.

### 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 for both sets of curves.
- The LCS was prepared using a secondary source. All second source verification criteria were met.

- All initial calibration verification (ICV) 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. Both blanks were non-detect for all target VOCs. No target VOC was detected at or above the associated MDL in the blanks.

**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 one (1) on-post groundwater sample which was collected on September 4, 2014 and analyzed for cadmium, chromium, and lead.

The ICP-AES metals analysis was performed using USEPA SW846 Method 6010B. The on-post well sample was analyzed following the procedures outlined in the CSSA QAPP and was prepared and analyzed within the holding time required by the method.

The sample for ICP-AES metals was digested in batch #189943. The analysis was performed undiluted.

**Accuracy**

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

All LCS recoveries were within acceptance criteria.

**Precision**

Precision could not be evaluated due to 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 preservation and holding times; and

- Examining laboratory blank for cross contamination of samples during analysis.

The sample was 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 analysis 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 ICP-AES portion of this SDG consisted of one (1) on-post groundwater sample collected on September 4, 2014 and analyzed for mercury.

The mercury analysis was performed using USEPA SW846 Method 7470A. The on-post well sample was analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury sample was prepared in batch #190303B. The analysis was 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 evaluated due to 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.

The sample was 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 analysis 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.

The mercury result for the sample 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- and off-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 groundwater samples and the associated field quality control (QC) sample collected from on-post and off-post Camp Stanley Storage Activity (CSSA) on September 8 and 9, 2014. The samples were assigned to the following Sample Delivery Group (SDG). All on-post samples were analyzed for volatile organic compounds (VOCs) and metals including cadmium, chromium, lead, and mercury. Three drinking water wells have the following additional metals analyzed: arsenic barium, copper, and zinc.

74243

The field QC samples associated with this SDG were two sets of parent/field duplicate (FD), one set of matrix spike/matrix spike duplicate (MS/MSD), and two trip blanks (TBs). TBs were 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. The samples in this SDG were shipped to the laboratory in two coolers. The coolers were received by the laboratory at a temperature of 2.5 ºC and 3.0ºC, which were both within the 2-6ºC 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 seventeen (17) samples, including eleven (11) on-post groundwater samples, two FDs, one pair of MS/MSD, and two (2) TBs. All samples were collected on September 8 and 9, 2014 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 batch (#189920) 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. MS/MSD analyses were performed with sample CS-1.

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

### Precision

Precision was evaluated based on the relative percent difference (%RPD) of MS/MSD and parent/FD results. Samples CS-MW1-LGR and CS-12 were collected in duplicate.

%RPDs of the MS/MSD results were compliant.

**CS-MW1-LGR**

| Compound | Parent, µg/L | FD, µg/L | %RPD | Criteria (%RPD) |
|---|---|---|---|---|
| *cis*-1,2-DCE | 43.51 | 45.90 | 5.3 | |
| TCE | 33.75 | 36.51 | 7.9 | |
| PCE | 27.16 | 28.46 | 4.7 | ≤20 |
| *trans*-1,2-DCE | 0.69 | 0.67 | 2.9 | |

None of the VOCs were detected at or above reporting limits, the %RPD calculations were not applicable

### 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 for both sets of curves.
- The LCS was prepared using a secondary source. All second source verification criteria were met.
- All initial calibration verification (ICV) criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- All internal standard criteria were met.

There were one method blank and two TBs associated with the VOC analyses in this SDG. Both blanks were non-detect for all target VOCs. No target VOC was detected at or above the associated MDL in the blanks.

**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 fifteen (15) on-post groundwater samples which were collected on September 8 and 9, 2014 and analyzed for cadmium, chromium, and lead. Three drinking water wells were also analyzed for the following metals: arsenic barium, copper, and zinc.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. These on-post well 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 #190246. All analyses were performed undiluted.

**Accuracy**

Accuracy was evaluated using the percent recovery obtained from the LCS, MS, and MSD. Sample CS-1 was used for the MS/MSD analyses.

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

**Precision**

Precision was evaluated based on the %RPD of MS/MSD and parent/FD. Samples CS-MW1-LGR and CS-12 were collected in duplicate.

All %RPDs of MS/MSD were compliant.

Other than the metals listed below, none of the metals were detected at or above the reporting limits, therefore, the %RPD calculation were not applicable.

**CS-12**

| Metals | Parent, mg/L | FD, mg/L | %RPD | Criteria, %RPD |
|---|---|---|---|---|
| Barium | 0.0313 | 0.0316 | 1.0 | ≤20 |
| Zinc | 0.080 | 0.077 | 3.8 | |

**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.
- 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 ICP-AES portion of this SDG consisted of fifteen (15) on-post groundwater samples collected on September 8 and 9, 2014 and analyzed for mercury. It included eleven on-post groundwater, two FDs, and a set of MS/MSD.

The mercury analyses were performed using USEPA SW846 Method 7470A. These on-post well 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 #190307. The analyses were performed undiluted.

### Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, MS, and MSD. Sample CS-12 was used for MS/MSD analyses.

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

### Precision

Precision was evaluated based on the %RPD of MS/MSD and parent/FD. Samples CS-MW1-LGR and CS-12 were collected duplicate.

The %RPD of MS/MSD was compliant.

Mercury was not detected at or above the reporting limit in both sets of parent/FD samples.

### 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.

All 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 90%.

**DATA VERIFICATION SUMMARY REPORT**

**for one 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 one on-post groundwater samples and the associated field quality control (QC) sample collected from Camp Stanley Storage Activity (CSSA) on September 17, 2014. The samples were assigned to the following Sample Delivery Group (SDG). The on-post sample was analyzed for volatile organic compounds (VOCs) and metals including arsenic, barium, cadmium, chromium, copper, lead, zinc, and mercury.

74344

The field QC sample associated with this SDG was a 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. The samples in this SDG were shipped to the laboratory in one cooler. The cooler was received by the laboratory at a temperature of 3.0ºC, which was within the 2-6ºC 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) samples, including one (1) on-post groundwater samples and one (1) TB. Both samples were collected on September 17, 2014 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 batch (#190133) under one set of initial calibration (ICAL). Both 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 the lack of duplicate analyses 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.

Both samples in this data package were analyzed following the COC and the analytical procedures described in the CSSA QAPP, Version 1.0. Both 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 for both sets of curves.
- The LCS was prepared using a secondary source. All second source verification criteria were met.
- All initial calibration verification (ICV) 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. Both blanks were non-detect for all target VOCs. No target VOC was detected at or above the associated MDL in the blanks.

**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 on-post 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 one (1) on-post groundwater samples which was collected on September 17, 2014 and analyzed for arsenic, barium, cadmium, chromium, copper, lead, and zinc.

The ICP-AES metals analyses were performed using USEPA SW846 Method 6010B. This on-post well sample was analyzed following the procedures outlined in the CSSA QAPP and was prepared and analyzed within the holding time required by the method.

The sample for ICP-AES metals was digested in batch #190576. The sample was analyzed undiluted.

**Accuracy**

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

All LCS recoveries were within acceptance criteria.

**Precision**

Precision could not be evaluated 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 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.
- 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 sample 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 ICP-AES portion of this SDG consisted of one (1) on-post groundwater sample collected on September 17, 2014 and analyzed for mercury.

The mercury analysis was performed using USEPA SW846 Method 7470A. This on-post well sample was analyzed following the procedures outlined in the CSSA QAPP, prepared and analyzed within the holding time required by the method.

The mercury sample was prepared in batch #190576. The analysis was 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 evaluated 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.

This sample was 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.

All mercury result for the sample 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%.