MONITORING WELL INSTALLATION AND GROUNDWATER QUALITY SUMMARY BUCKEYE BRINE, LLC COSHOCTON, OHIO

Prepared For

BUCKEYE BRINE, LLC
23986 AIRPORT ROAD
KEENE TOWNSHIP,
COSHOCTON, OH 43812

Prepared By

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
250 OLD WILSON BRIDGE DRIVE
WORTHINGTON, OHIO 43085

CEC Project 185-016

FEBRUARY 2020

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1.0 INTRODUCTION

On behalf of Buckeye Brine, LLC (Buckeye Brine), Civil & Environmental Consultants, Inc. (CEC) is providing documentation regarding the installation of monitoring wells MW-1, MW-2 and MW-3 in December 2019 at the Buckeye Brine Class I Non-hazardous Underground Injection Control (UIC) facility (Facility) located at 23986 Airport Road in Coshocton, Ohio. This report also includes the analytical results for groundwater samples from these monitoring wells collected on December 27 and 28, 2019. Monitoring wells were installed at the Facility as a condition of the approved Class I Non-hazardous UIC permit effective June 25, 2019. Monitoring well installation and sampling were completed in accordance with the procedures in CEC's proposal dated October 24, 2019, the Facility Groundwater Monitoring Plan (GWMP) prepared by EnviroTrac Ltd[1] and CEC's Addendum to the GWMP dated November 12, 2019.

[1] Groundwater Monitoring Plan, Class I Non-hazardous Underground Injection Control Permits, UIC 04-16-017-PTO-1 and UIC 04-16-018-PTO-1, 23986 Airport Road, Keene Township, Coshocton, Ohio 43812. Prepared for Buckeye Brine, LLC, 23986 Airport Road, Coshocton, Ohio 43812. Prepared by EnviroTrac Ltd., 176 Thorn Hill Road, Warrendale, Pennsylvania 15086. August 26, 2019.

2.0 MONITORING WELL LOCATIONS AND DEPTHS

Figure 1 provides the as-built monitoring well locations and surveyed coordinates. CEC surveyed the monitoring well locations on January 7, 2020. Monitoring wells were surveyed for coordinates, and elevation of the top of PVC riser and ground surface adjacent to the wells. Each monitoring well was installed within 30 feet of the adjacent UIC wellhead location.

Monitoring well depths were proposed in the GWMP and were expected to be approximately 330 feet below ground surface (bgs), with the target formation being the Black Hand Sandstone, also known by oil and gas well drillers as the Big Injun. Core samples and pressure testing results collected were used to position the monitoring well screened intervals. Monitoring well screens were positioned to span any observable fractures in core samples combined with any significant pressure testing flow zones. The GWMP Addendum was approved by Ohio EPA which allowed up to 30 foot long monitoring well screens. During drilling activities, Buckeye Brine contacted Ohio EPA to request extending well screened intervals up to 40 feet, which was verbally approved. Additional drilling and monitoring well installation information is provided in Section 4.0.

3.0 CROSS SECTIONS AND POTENTIOMETRIC SURFACE MAP

Figure 1 depicts the locations of two generalized geologic cross sections between monitoring well installations. Strata above the core interval at each well were determined from drill cuttings which were difficult to collect due to piping used to contain drilling mud and groundwater return at the borings as described in Section 4.2. Figure 2 provides the generalized cross section between monitoring wells MW-1 and MW-3. The generalized geologic cross section between monitoring wells MW-2 and MW-3 is provided on Figure 3. Based on the core interval at each boring, the Black Hand Sandstone is massive and is approximately 40 to 50 feet thick at MW-2 and MW-3. At MW-1, there is an approximate 10 foot thick shale interbedded within the sandstone unit. The Black Hand Sandstone is generally thickly bedded and fine grained with low fracture density.

A potentiometric surface map provided on Figure 4 was prepared using water levels collected prior to sampling on December 27, 2019. The potentiometric surface slopes from northeast to southwest with approximately 10 feet of hydraulic head change over a horizontal distance of approximately 675 feet. Because water levels used for potentiometric mapping on December 27, 2019 were collected within approximately six hours of well development at MW-3 and within approximately 17 hours of well development at MW-1 and MW-2, additional evaluation of the monitoring network potentiometric surface should be completed during future groundwater sampling events.

4.0 MONITORING WELL INSTALLATION ACTIVITIES

Monitoring wells MW-1, MW-2 and MW-3 were installed from December 8 to 22, 2019 at the locations provided on Figure 1. A CEC geologist monitored the drilling and well installation activities conducted by C.J. Well Services of Rowe, Virginia. Boring logs with well construction diagrams are provided in Appendix A. Table 1 – Monitoring Well Construction Summary, provides well construction details for MW-1, MW-2 and MW-3. During drilling activities, Buckeye Brine requested and received verbal approval from Ohio EPA to allow up to 40 foot screen lengths at each well, which was a modification to the GWMP Addendum. All cuttings, drilling mud and groundwater returned to the surface at each well locations was collected in an 8-foot by 12-foot by 8-foot deep water tight steel box and later transferred to a vacuum truck for off-site disposal.

4.1 Surface Casing Installation

Each well borehole was advanced from ground surface to competent bedrock using a 12-¼ inch outside diameter (O.D.) roller bit that allowed installation of 8-inch inside diameter (I.D.) threaded and coupled steel surface casing. Steel surface casing was installed to prevent cave-in of unconsolidated alluvial deposits and weathered bedrock and to seal off alluvial groundwater where encountered (MW-1). The 12-¼ inch OD borehole was advanced via mud rotatory methods at MW-1, where approximately 87 feet of unconsolidated deposits were encountered. Pressure cementing was employed at MW-1 to displace the drilling mud and provide a competent seal between the steel surface casing and the upper portion of bedrock. There were no alluvial deposits encountered at MW-2 and MW-3; thus, air rotatory methods were used for the 12-¼ inch O.D. borehole and steel surface casing installation.

4.2 Bedrock Drilling and Pressure Testing

Following the installation of steel surface casing, each borehole was advanced using a 7-$^{7}/_{8}$ inch I.D. air hammer bit to the designated target depth to begin NQ rock coring. Attempts were made to collect drill cuttings during this process; however, piping used to divert cuttings to the collection box made collection difficult at wells MW-2 and MW-3. At MW-1, the mud return velocity was causing mixing of drill cuttings in the trench leading to the collection box, making it difficult to determine the rock type vs. depth in the air hammer interval. Boring logs in Appendix A provide generalized descriptions of air hammer drill cuttings at each well.

After reaching the target zones to begin bedrock coring (275 feet bgs at MW-1, 260 feet bgs at MW-2 and 245 feet bgs at MW-3), NQ coring was used to advance the borehole to the final depth. The coring depths were successively adjusted at MW-2 and MW-3 based on the observed sandstone depth interval at the previous corehole. Core runs were 20 feet in length. Boring logs

that provide core sample descriptions, including rock quality designation (RQD) and recovery, which are both indicators for bedrock competency and fracture density. Natural fractures observed from core samples were few.

Hydraulic pressure testing was completed in the core interval at each monitoring well boring to assist with evaluation of the water bearing capacity in each bedrock core interval. Pressure testing results are provided in Table 2. Each 20 foot interval was then packer tested in 10 foot intervals with some overlap. Each packer test was conducted for 5 minutes and tested pressure intervals ranged from 5 to 20 pounds per square inch (psi). Pressure testing results ranged from 0 to 1.5 gallons per minute (gpm) at MW-1, from 1.5 to 5 gpm at MW-2 and from 1 to 6 gpm at MW-3.

At the completion of pressure testing, each corehole was reamed using the 7-$^{7}/_{8}$ inch air hammer bit to the target monitoring well bottom depth, based on several factors including packer test results, natural fractures and fracture density. Upon reaching the target depth, cuttings from the reamed borehole were removed as best as possible by blowing and surging before removing the hammer bit and drill rods from the borehole.

4.3 Monitoring Well Installation

Monitoring wells were constructed with 4-inch I.D., factory-machined 0.010-inch polyvinyl chloride (PVC) well screens and 4-inch I.D., flush threaded, Schedule 40 PVC riser pipe. All pipe threads have O-ring seals. For this project, the screen length at each well varied from 40-feet at MW-1, to 20-feet at MW-2, to 30-feet at MW-3. The annular space around each well screen was backfilled with a clean silica sand filter pack to minimize the passage of formation materials into the well. The filter pack was installed to approximately 5 feet to 12 feet above the top of the screen. A minimum 5 foot thick, hydrated bentonite pellet seal was placed above the sand filter pack. The bentonite pellet seal was allowed to hydrate for at least 12 hours before installing bentonite grout above the pellet seal. The remaining annular space above the bentonite pellet seal was filled with a bentonite grout slurry that was placed in lifts using downhole tremie grouting methods. A four bag mix (94 pound bags) was tremied into place and allowed to set up for at least 12 hours before grouting the remaining annulus to the ground surface. Granular bentonite was used to top off each well following over-night settlement of the bentonite grout.

At the surface, each well was completed with a 6-inch I.D., locking protective steel casing. The protective casings are installed within the 8-inch I.D. steel surface casing and approximately 2-$^{1}/_{2}$ feet bgs and are further anchored by a 4-foot x 4-foot x 6-inch reinforced concrete pad. The annular space between the protective casing and the PVC riser was filled with coarse sand to approximately 3-inches below the top of the PVC. Weep holes were drilled just above the concrete pads to prevent accumulation of water between the PVC casing and the protective casing. A complete

monitoring well construction summary is provide in Table 1, including top of casing (TOC) elevations, ground elevations, and northing and easting coordinates.

4.4 Well Development

The Buckeye Brine monitoring wells were developed on December 26 and 27, 2019. Development was completed by surging and pumping using a Grundfos® Redi-Flo3 portable pump in order to restore the natural hydraulic conductivity of the formation and remove fine-grained sediment from the filter pack. Field parameters including pH, temperature, specific conductivity and turbidity were measured at regular intervals during well development. Well development was considered complete after removing at least 10 well volumes and attainment of stable field parameters. Pump tubing was disposed following use at each well. The portable pump was decontaminated prior to its use in each well.

Well development forms are provided in Appendix B. Maximum pumping rates were used to remove fines and groundwater collected in the wells during drilling and well installation. Based on pumping rate adjustments during development, MW-1 exhibited an estimated sustained yield of approximately 2 to 3 gallons per minute (gpm). Estimated sustained yield at MW-2 and MW-3 are approximately ½ to 1 gpm.

5.0 SAMPLING PROCEDURES

Groundwater sampling was conducted by CEC on December 27 and 28, 2019. Field Data Sheets (FDSs) for this sampling event are provided in Appendix C. Water levels collected prior to well sampling are provided in Table 3.

5.1 Monitoring Well Sampling

Low-flow sampling procedures were used to collect groundwater samples for the December 2019 sampling event. The focus of low-flow purging is to minimize drawdown and reach stabilization of field water quality parameters rather than to purge a predetermined volume or to purge the well dry. Low-flow purging and sampling was accomplished with a portable bladder pump. Flow rates (usually less than 500 ml/min) were selected based on individual well yields.

While purging, field measurement of pH, specific conductance, turbidity, and temperature were collected at approximately five-minute intervals. Stabilization of pH, specific conductance and temperature were the criteria for determining when purging was complete and the well was ready to be sampled. Stabilization of field parameters was obtained when three consecutive readings for each parameter has stabilized in accordance with the following schedule:

- pH ± 0.1 units
- Specific Conductance ± 3%
- Temperature ± 0.5°C

Turbidity was measured during purging and sampling; however, it is not used as a stabilization parameter.

5.2 Sample Containers, Handling and Analysis Procedures

Groundwater samples collected in the field were placed immediately into sample containers supplied by the laboratory and stored on ice until shipped to the analytical laboratory. A chain-of-custody (COC) form accompanied the samples to the laboratory.

Geochemical Testing of Somerset, Pennsylvania was subcontracted to perform analytical testing. Geochemical Testing is a National Environmental Laboratory Accreditation Program (NELAP) certified laboratory. The laboratory analytical report in Appendix D.

5.3 Quality Assurance / Quality Control Procedures

During the sampling event, three QA/QC samples were collected; one field duplicate (Dup-1), one equipment rinse blank (ERB-1) and one trip blank. The field duplicate was collected from MW-2 and was analyzed for the same constituents as the wells. The equipment rinse blank was collected following sampling at MW-1 using laboratory-grade de-ionized water and was analyzed for the same constituents as the wells. The trip blanks were prepared by the laboratory and accompanied the samples at all times during shipping from the laboratory and sampling. The trip blanks was analyzed for volatile organic compounds (VOCs) only. No QA/QC issues were reported by the laboratory for the field duplicate, equipment rinse blank or trip blank during the December 2019 groundwater sampling event.

6.0 GROUNDWATER QUALITY

Groundwater samples collected during the December 2019 groundwater sampling event were analyzed in accordance with parameters specified in the August 2019 Sampling and Analysis Plan[2] (SAP). During the December 2019 sampling event, groundwater samples were collected from monitoring wells MW-1, MW-2 and MW-3 on December 27 and 28, 2019. It should be noted that per the SAP, the analytical list requires VOCs to be sampled only during the first sampling event. During the December 2019 sampling event, three QA/QC samples were collected; one field duplicate (Field Dup), one equipment rinse blank (Rinsate Blank) and one trip blank (trip blank analyzed for the list of VOC parameters only). The laboratory report for the December 2019 samples is included in Appendix D.

6.1 Groundwater Quality Summary

Table 4 provides a summary of the groundwater sampling results from the December 2019 sampling event. Analytical data that exceeds established water quality standards is presented in bold text. In addition, bar charts were prepared for the following detected constituents; ammonia, boron, calcium, chloride, iron, manganese, potassium, specific conductance and Total Dissolved Solids (TDS) are included in Appendix E. As depicted on the bar charts, detected concentrations of inorganic constituents are generally higher at monitoring well MW-1 with the exception of boron and pH. Observed TDS concentrations are twice as high at MW-1 in comparison to MW-2 and MW-3. Groundwater quality with TDS concentrations greater than 10,000 mg/L is considered saline which is observed at all three monitoring wells.

It should be noted that there were no detections above the practical quantitation limits (PQL) for fluoride or VOC parameters.

6.2 Comparison to USEPA Maximum Contaminant Levels (MCLs)

Of the inorganic parameters analyzed in accordance with the August 2019 SAP, there are no constituents that have an established United States Environmental Protection Agency (USEPA) Maximum Contaminant Level (MCL). It should also be noted that there were no detections above the PQL for analyzed VOC parameters.

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[2]Sampling and Analysis Plan and Quality Assurance Project Plan, Class I Non-Hazardous Underground Injection Control Permits UIC 04-16-017-PTO-1 and UIC 04-16-018-PTO-1, Coshocton County, Ohio. Prepared for Buckeye Brine LLC, 23986 Airport Road, Coshocton, Ohio 43812. Prepared by EnviroTrac Ltd., Warrendale, PA 15086, August 2019.

6.3 Comparison to USEPA Secondary Maximum Contaminant Levels (SMCLs)

There are six constituents analyzed during the 2019 monitoring event (chloride, fluoride, iron, pH, manganese and TDS) that have Secondary MCLs (SMCLs). SMCLs are non-enforceable guidelines that result in impact to the waters' aesthetic effects such as discoloration, odor, and taste. Monitoring wells with concentrations exceeding SMCLs during the December 2019 sampling event are summarized below:

- All monitoring wells exceeded the SMCL for chloride, iron, manganese and TDS.

Concentrations of chloride and TDS at MW-1, MW-2 and MW-3 were all above the SMCL limits of 250 mg/L and 500 mg/L, respectively. Concentrations of manganese and iron at MW-1, MW-2 and MW-3 were all above the SMCL limits of 0.3 mg/L and 0.05 mg/L, respectively. Concentrations of chloride, iron, manganese and TDS at MW-1 are generally twice as high as observed at wells MW-2 and MW-3. As stated previously, observed groundwater quality at all monitoring wells is considered saline.

6.4 Comparison to Health Advisory Concentrations

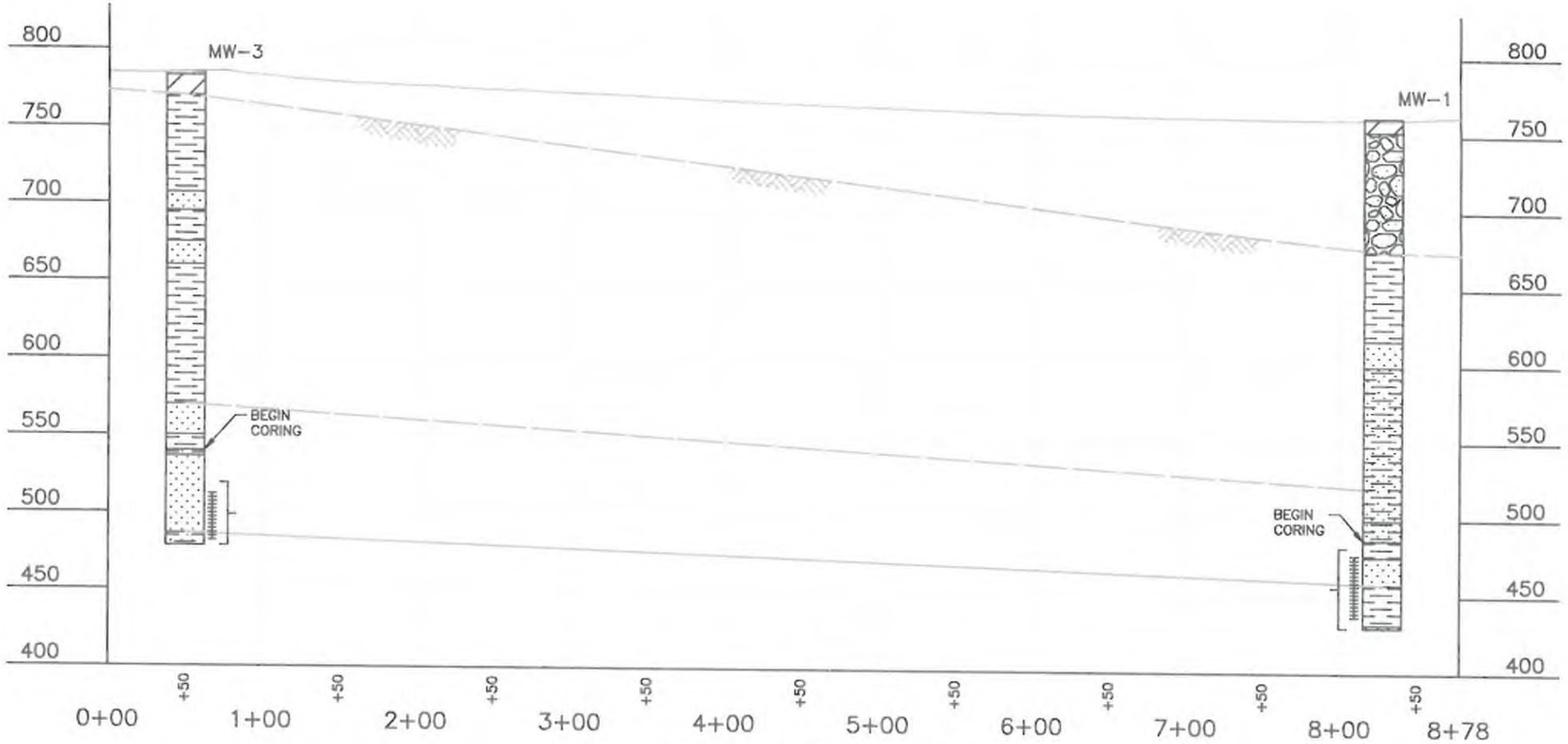
For the list of parameters analyzed, ammonia does not have MCLs or SMCLs, but does have a Health Advisory concentrations. A Health Advisory is a limit established for drinking water where a maximum concentration is not expected to cause any adverse non-carcinogenic effects in an adult over a lifetime of exposure. The taste threshold is defined as the lowest concentration where a sensitive individual may detect the chemical in drinking water. Ammonia has a Health Advisories of 30 mg/L. As detailed in Table 4, ammonia concentrations for MW-1, MW-2 and MW-3 were all below the below the Health Advisory of 30 mg/L.

7.0 CONCLUSIONS

- Monitoring wells MW-1, MW-2 and MW-3 were installed December 8 to 22, 2019.
- CEC conducted the December 2019 groundwater sampling event on December 27 to 28, 2019 in accordance with the August 2019 SAP.
- There are no MCLs for the inorganic and general chemistry parameters analyzed.
- There were no volatile organic compounds detected in groundwater.
- All monitoring wells exceeded the SMCL for chloride, iron, manganese and TDS.
- The December 2019 groundwater sampling event did not exceed the Health Advisory concentrations.
- There were no volatile organic compounds detected in groundwater.
- The December 2019 groundwater quality data includes the first sampling event for the monitoring wells MW-1, MW-2 and MW-3. Future sampling results will provide additional data for water quality trend analyses.
- With the exception of VOCs, the remaining constituents in Table 4 will continue to be monitored and evaluated further during upcoming groundwater sampling events.

FIGURES


880
870
860
850
840
830
820
810
800
790
780
770
MW-1
A
760
760



CROSS SECTION A-A'

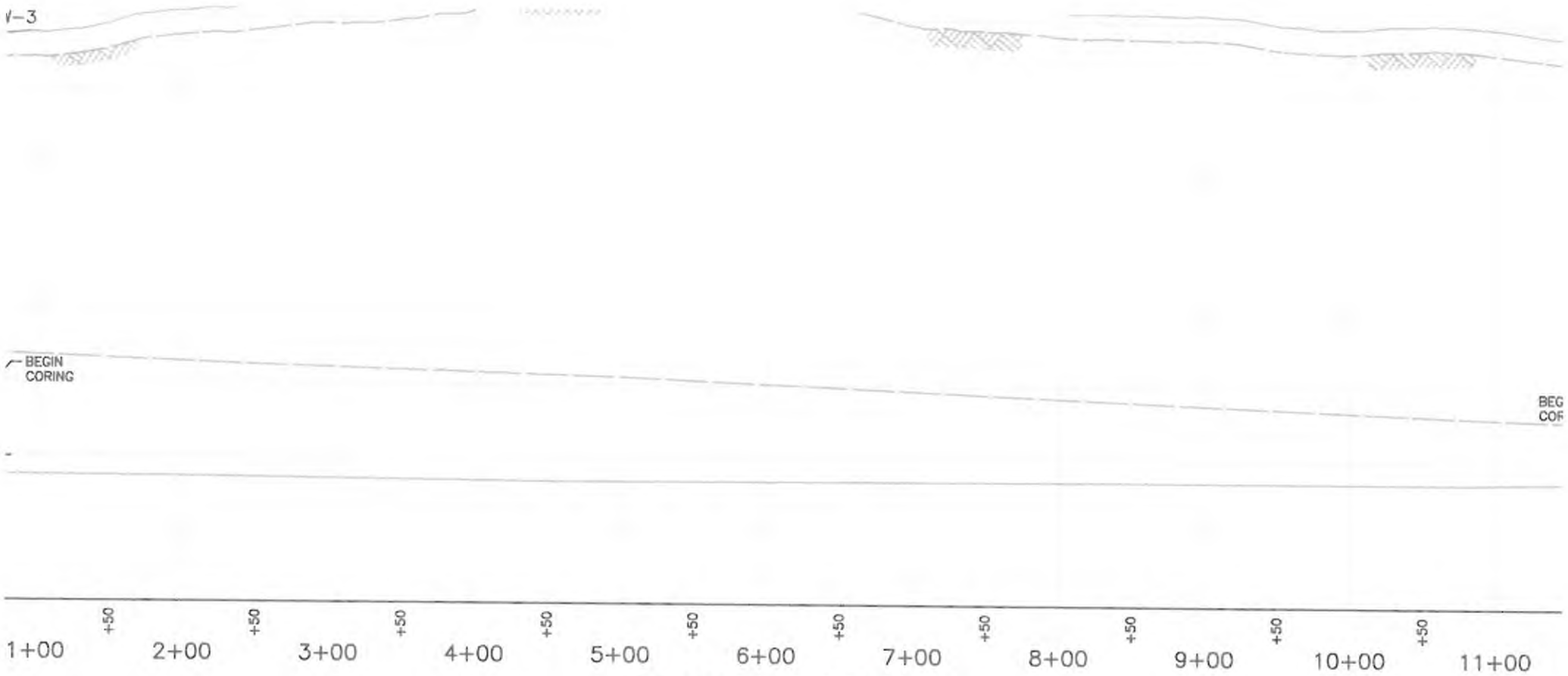
SCALE H:1"=100'; V:1"=100'

LEGEND

- CLAY
- SHALE
- SAND & GRAVEL
- INTERBEDDED SANDSTONE & SHAL
- SANDSTONE
- TOP OF BEDROCK

MATION PRESENTED HEREIN
IE TEST BORING LOCATIONS
CONDITIONS AT OTHER

EEN TEST BORINGS GENERALLY
OLATION. ACTUAL CONDITIONS



CROSS SECTION B-B'

SCALE H:1"=100'; V:1"=100'

MATION PRESENTED HEREIN
IE TEST BORING LOCATIONS
CONDITIONS AT OTHER

EEN TEST BORINGS GENERALLY
)LATION. ACTUAL CONDITIONS

LEGEND

- CLAY
- SHALE
- SAND & GRAVEL
- INTERBEDDED SANDSTONE & SHAL
- SANDSTONE
- TOP OF BEDROCK

GROUNDWATER CONDITIONS

1. A BARE EARTH
4. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO

TABLES

te lled	Coordinates Northing	Coordinates Easting	Ground Elevation (ft. MSL)	Top of Casing Elevation (ft. MSL)	Monitored Interval (ft MSL)		Monitored Interval (ft BGS)		Well Diameter (in.)	Stratigraphic Unit
					Top	Bottom	Top	Bottom		
1/19	231884.50	2150261.00	762.23	765.39	477.2	437.2	285.0	325.0	4	Sandstone and shale
2/19	232402.10	2150685.00	782.55	785.24	505.6	485.6	277.0	297.0	4	Sandstone and shale
9/19	232211.80	2149578.00	785.22	788.31	512.2	482.2	273.0	303.0	4	Sandstone and shale

d to Ohio state plane NAD83 North zone Geiod 12B

tends from the top of the sand filter pack to the bottom of the well screen.

TABLE 2
HYDRAULIC PRESSURE TESTING RESULTS
BUCKEYE BRINE, LLC
KEENE TOWNSHIP, COSHOCTON COUNTY, OHIO
CEC PROJECT 185-016

Well No.	Interval Tested (ft. BGS)	Top of Casing Elevation (ft. MSL)	Interval Tested (ft. MSL)	Pressure (PSI)	FLOW (GPM)
MW-1	275' - 285'	765.39	490.39' - 480.39'	5	0
				10	0
	280' - 290'	765.39	485.39' - 475.39'	5	0
				10	0
				15	0
	290' - 300'	765.39	475.39' - 465.39'	5	0
				10	1
				15	1.5
	295' - 305'	765.39	470.39' - 460.39'	5	0.5
				10	0.75
				15	0.75
	305' - 315'	765.39	460.39' - 450.39'	5	0.75
				10	0.75
				15	1.25
	315' - 325'	765.39	450.39' - 440.39'	5	0.75
				10	1
				15	2
MW-2	267' - 277'	785.24	515.55' - 505.55'	10	2
				20	3
	277' - 287'	785.24	505.55' - 495.55'	10	2
				20	4.5
	287' - 297'	785.24	495.55' - 485.55'	10	2
				20	5
	297' - 307'	785.24	485.55' - 475.55'	10	1.5
				20	1.5
MW-3	260' - 270'	788.31	525.22' - 515.22'	10	2
				20	3
	270' - 280'	788.31	515.22' - 505.22'	10	1
				20	5
	280' - 290'	788.31	505.22' - 495.22'	10	5
				20	5
	290' - 300'	788.31	495.22' - 485.22'	10	5
				20	6

TABLE 3
GROUNDWATER ELEVATIONS - DECEMBER 27, 2019
BUCKEYE BRINE, LLC
KEENE TOWNSHIP, COSHOCTON COUNTY, OHIO
CEC Project 185-016

WELL ID	Ground Elevation (ft.MSL)	TOC Elevation (ft.MSL)	December 27, 2019	
			DTW (ft)	Groundwater Elevation (ft. MSL)
MW-1	762.23	765.39	29.90	735.49
MW-2	782.55	785.24	39.50	745.74
MW-3	785.22	788.31	53.62	734.69

Notes:

TOC = Top of Casing (PVC Riser Pipe Datum Mark)

DTW = Depth to Water from TOC

ft = feet

MSL = mean sea level

TABLE 4
LABORATORY ANALYTICAL RESULTS - DECEMBER 2019 SAMPLING EVENT
BUCKEYE BRINE, LLC
KEENE TOWNSHIP, COSHOCTON COUNTY, OHIO
CEC Project 185-016

Parameter	USEPA MCL (if applicable)	Units	MW-1 12/28/2019	MW-2 12/28/2019	MW-3 12/27/2019	Field Dup 12/28/2019	Rinsate Blank 12/28/2019	Trip Blank
Ammonia Nitrogen	30 (1)	mg/L as N	13.6	7.49	8.72	7.92	<0.1	--
Boron	No MCL	mg/L	1.24	1.41	1.37	1.42	<0.05	--
Calcium	No MCL	mg/L	545	164	196	165	0.13	--
Chloride	250 (2)	mg/L	**20,700**	**9,640**	**12,000**	**10,200**	<1	--
Fluoride	2 (2)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	--
Iron	0.3 (2)	mg/L	**2.23**	**0.38**	**0.531**	**0.39**	<0.05	--
Lab pH	6.5-8.5 (2)	S.U.	7.35	7.73	7.68	7.68	**5.67**	--
Manganese	0.050 (2)	mg/L	**0.189**	**0.08**	**0.069**	**0.081**	<0.01	--
Potassium	No MCL	mg/L	82.3	38.2	43	42.3	<0.5	--
Specific Conductance	No MCL	µmhos/cm	48,600	26,500	28,900	26,300	6	--
Total Dissolved Solids	500 (2)	mg/L	**31,000**	**15,300**	**16,800**	**15,400**	<20	--
Volatile Organic Compounds	--	ug/l	BPQL	BPQL	BPQL	BPQL	BPQL	BPQL
Volatile Organic Compounds - No Detections								

Analytical data that exceeds respective water quality standards is presented in **bold text.**

MCL-Federal Primary or Secondary Maximum Contaminant Level

(1) Represents the Health Advisory where the concentration of the chemical in DRINKING WATER that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure (based on a 70 kg-adult that consumes 2 liters of water per day for a lifetime).

(2) Represents a Secondary MCL. Non-enforceable guideline that relates to the aesthetic effects of drinking water (taste, odor, and color).

mg/l = milligrams per liter

ug/l = micrograms per liter

APPENDIX A

MONITORING WELL BORING LOGS

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-1

Client: Buckeye Brine

Project Name: Buckeye Brine Drilling

Project Number: 185-016

Project Location: 23986 Airport Road Coshocton, OH 43812

Date Started: 12/08/2019

Date Completed: 12/14/2019

CEC Field Representative: Nick Faust

Log Checked By: Roy Stanley

Ground Elevation: 762.23 ft amsl

Casing Elevation: 765.39 ft amsl

Latitude: 40.301272

Longitude: -81.848371

Drilling Contractor: CJ's Well Service

Driller: Anthony Stiltner

Drilling Method: Roller Bit + Air Coring + Air Hammer

Core Size: NA

Backfill: 4" Monitoring Well Installed

Borehole Diameter: 7.88 in

Well Installed: 12/14/2019

Stickup: 3.2 ft

Key: NA

Outer Casing: NA

Monitoring Equipment: NA

Development Method: NA

Results: NA

Yield: NA

Water Levels

- At Drilling: NA
- End of Drilling: NA
- After Drilling: NA
- Temporary Well: NA
- Permanant Well : NA

Notes: 12 ¼" Roller Bit 0'-99' (Mud Fluid)
8" I.D. Thread & Couple Steel Casing 0'-99'
7 7/8" Air Hammer 99'-275' (Logged Cuttings)
NQ Air Coring 275'-332'
7 7/8" Air Hammer 275'-332' (Reaming)

NA - Not Available; bgs - below ground surface; amsl - above mean sea level

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)
0		Brown, CLAY		
9.0 ft / 753.2		Brown, Fine to Medium SAND		
20		Medium to Coarse SAND		
		Fine to Medium SAND		
25		Fine to Coarse SAND	RB	

WELL DIAGRAM

- Cement 0'-2.5'
- 12 1/4" Borehole 0'-99'
- 4" Schedule 80 PVC Riser 0'-285'
- 8" I.D. Steel Surface Casing 0'-99'
- Surface Casing Cemented 0'-99'
- Bentonite Grout 2.5'-273'

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine | **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 | **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
55		Brown, Fine to Medium SAND			12 1/4" Borehole 0'-99'
60					Bentonite Grout 2.5'-273'
65		Fine SAND			8" I.D. Steel Surface Casing 0'-99'
70					
75		Fine to Coarse SAND	RB		4" Schedule 80 PVC Riser 0'-285'
80					
85		87.0 ft 675.2			
90		Black, SHALE			
95		Sandy SHALE			
100					

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
105		Black, SHALE			7 7/8" Borehole 99'-332'
110		Blowing Water 110' (Est. 15 gpm)			Bentonite Grout 2.5'-273'
115					
120					
125			AH		
130					
135					
140					
145		145.0 ft 617.2 Gray, Fine to Medium SANDSTONE			4" Schedule 80 PVC Riser 0'-285'
150					

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
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MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
155		Gray, Fine to Medium SANDSTONE			7 7/8" Borehole 99'-332'
160		162.0 ft			
165		Interbedded SANDSTONE AND SHALE			
170					
175			AH		4" Schedule 80 PVC Riser 0'-285'
180					Bentonite Grout 2.5'-273'
185					
190					
195					
200					

(Continued Next Page)

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
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MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
205		Interbedded SANDSTONE AND SHALE			7 7/8" Borehole 99'-332'
210					
215					
220					4" Schedule 80 PVC Riser 0'-285'
225			AH		Bentonite Grout 2.5'-273'
230					
235					
240					
245					
250					

(Continued Next Page)

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MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
255		Interbedded SANDSTONE AND SHALE			7 7/8" Borehole 99'-332'
260					Bentonite Grout 2.5'-273'
		262.0 ft — 500.2			
		Dark, Gray SHALE	AH		
265					
270					
		275.0 ft — 487.2			
275		Begin Coring at 275'			
		Dark Gray, SHALE, Fresh Weathered, Slightly Broken, Soft			Bentonite Pellets 273'-280'
280		Packer test results (each measurement taken over a 5 min interval): 275'-285' = 0 GAL 5 PSI 0 GAL 10 PSI 280'-290' = 0 GAL 5 PSI 0 GAL 10 PSI 0 GAL 15 PSI 290'-300' = 0 GAL 5 PSI 1 GAL 10 PSI 1.5 GAL 15 PSI			No. 5 Silica Sand 280'-332'
285			RC C-1	100 (98)	Top of Screen at 285'
		286.0 ft — 476.2			
		Gray, SANDSTONE, Fresh Weathered, Hard, Thick Bedded, Fine to Medium			
		288.0 ft — 474.2			
		289.0 ft — 473.2			
		Gray, SHALE AND SANDSTONE, Laminated			
290		Gray, Fine to Medium Grained, SANDSTONE, Hard			4" PVC Screen With 0.010 Inch Slots 285'-325'
		1" SHALE seam at 293.5'			
295		1/2" SHALE seam at 295.5'			
		298.0 ft — 464.2	RC C-2		
		Dark Gray, Fine SANDSTONE AND SHALE Interbedded, Fresh Weathered, Slightly Broken, Medium Hard, Thin Bedded			
300					

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MONITORING WELL NUMBER MW-1

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
		Dark Gray, Fine SANDSTONE AND SHALE Interbedded, Fresh Weathered, Slightly Broken, Medium Hard, Thin Bedded	RC C-2	100 (80)	7 7/8" Borehole 99'-332'
		304.5 ft / 457.7			
305		Gray, SHALE, Fresh Weathered, Medium Bedded			4" PVC Screen With 0.010 Inch Slots 285'-325'
		Angular Fracture at 306.5'			
		Angular Fracture at 308'			
310		Packer test results (each measurement taken over a 5 min interval): 295'-305' = 0.5 GAL 5 PSI 0.75 GAL 10 PSI 0.75 GAL 15 PSI 305'-315' = 0.75 GAL 5 PSI 0.75 GAL 10 PSI 1.25 GAL 15 PSI 315'-325' = 0.75 GAL 5 PSI 1 GAL 10 PSI 2 GAL 15 PSI	RC C-3	100 (98)	
315					
320		Angular Fracture at 319'			No. 5 Silica Sand 280'-332'
		Angular Fracture at 322.5'			
		324.0 ft / 438.2			
325		Gray, SHALE AND SANDSTONE, Fresh Weathered, Thin Bedded, Fine	RC C-4	100 (99)	Bottom of Screen at 325'
		330.0 ft / 432.2			
330		Gray, SANDSTONE, Fresh Weathered, Hard, Medium Bedded, Medium			
		332.0 ft / 430.2			TD 332'
		End of boring at 332.0 feet			
335					
340					
345					
350					

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-2

Client: Buckeye Brine

Project Name: Buckeye Brine Drilling

Project Number: 185-016

Project Location: 23986 Airport Road Coshocton, OH 43812

Date Started: 12/20/2019

Date Completed: 12/22/2019

CEC Field Representative: Nick Faust

Log Checked By: Roy Stanley

Ground Elevation: 782.55 ft amsl

Casing Elevation: 785.24 ft amsl

Latitude: 40.302684

Longitude: -81.846837

Drilling Contractor: CJ's Well Service

Driller: Anthony Stiltner

Drilling Method: Roller Bit + Air Coring + Air Hammer

Core Size: NA

Backfill: 4" Monitoring Well Installed

Borehole Diameter: 7.88 in

Well Installed: 12/22/2019

Stickup: 2.7 ft

Key: NA

Outer Casing: NA

Monitoring Equipment: NA

Development Method: NA

Results: NA

Yield: NA

Water Levels

- At Drilling: NA
- End of Drilling: NA
- After Drilling: NA
- Temporary Well: NA
- Permanant Well : NA

Notes: 12 ¼" Roller Bit 0'-40' (Mud Fluid)
8" I.D. Thread & Couple Steel Casing 0'-40'
7 7/8" Air Hammer 40'-260' (Logged Cuttings)
NQ Air Coring 260'-310'
7 7/8" Air Hammer 260'-299' (Reaming)

NA - Not Available; bgs - below ground surface; amsl - above mean sea level

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)
0		Gray, COBBLES, (FILL)		
		1.5 ft 781.0		
		Red, CLAY		
		3.5 ft 779.0		
		Gray, Fine to Medium SANDSTONE		
5		Drilling Hard from 5' to 15'		
10				
15				
		20.0 ft 762.0		
20		Dark Gray, SHALE	RB	
25				
30				
35				
40				
45			AH	
50				

WELL DIAGRAM

- Cement 0'-2.5'
- 12 1/4" Borehole 0'-40'
- 4" Schedule 80 PVC Riser 0'-277'
- 8" I.D. Steel Surface Casing 0'-40'
- Surface Casing Backfilled with Cuttings 0'-40'
- Bentonite Grout 2.5'-260'
- 7 7/8" Borehole 40'-299'

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Suite 250
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MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
55		Dark Gray, SHALE 55.0 ft 727.6 Gray, Fine to Medium SANDSTONE			7 7/8" Borehole 40'-299'
60					
65					
70					4" Schedule 80 PVC Riser 0'-277'
75			AH		
80					Bentonite Grout 2.5'-260'
85					
90					
95					
100					

(Continued Next Page)

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MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
105		Gray, Fine to Medium SANDSTONE			7 7/8" Borehole 40'-299'
110					Bentonite Grout 2.5'-260'
115					
120					
125			AH		
130					
135					
140					4" Schedule 80 PVC Riser 0'-277'
145					
150					

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MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
155		Gray, Fine to Medium SANDSTONE			7 7/8" Borehole 40'-299'
160					
165					
170					4" Schedule 80 PVC Riser 0'-277'
175			AH		
180					Bentonite Grout 2.5'-260'
185					
190					
195					
200					

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MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
205		Gray, Fine to Medium SANDSTONE			7 7/8" Borehole 40'-299'
210					
215					
220					4" Schedule 80 PVC Riser 0'-277'
225			AH		Bentonite Grout 2.5'-260'
230					
235		235.0 ft 547.6 Dark, SHALE			
240					
245		Begin Coring at 245'			
250					

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Civil & Environmental Consultants, Inc.
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MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine | **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 | **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
		Dark, SHALE			7 7/8" Borehole 40'-299'
255		256.0 ft 526.6	AH		Bentonite Grout 2.5'-260'
		Light Gray, SANDSTONE			
		260.0 ft Begin Coring at 260' 522.6			
260		Gray, SANDSTONE, Fine			Bentonite Pellets 260'-265'
		Thin SHALE Bedding, with Nodules Medium SANDSTONE			
265					4" Schedule 80 PVC Riser 0'-277'
		Packer test results (each measurement taken over a 5 min interval): 307'-297' = 1.5 GAL 10 PSI 1.5 GAL 20 PSI 297'-287' = 2 GAL 10 PSI 5 GAL 20 PSI 287'-277' = 2 GAL 10 PSI 4.5 GAL 20 PSI 277'-267' = 2 GAL 10 PSI 3 GAL 20 PSI	RC C-1	100 (96)	No. 5 Silica Sand 265'-299'
270					
		Gray SANDSTONE with Black SHALE Laminations, Fine from 274' to 275' Lt. Gray SANDSTONE, Fine, with Calcareous Cement from 275.5' to 277'			Top of Screen at 277'
275					
280					
		Shale Streaks/Seams at 282.4' to 282.8'			
285		SHALE Streaks/Seams at 284.7' to 284.9'			
		Coarse SAND Bed with Angular Fractures at 286.4' to 286.8'			4" PVC Screen With 0.010 Inch Slots 277'-297'
290		Coarse SAND Bed with Angular Fractures at 289.4' to 290.1'	RC C-2	100 (96)	
		Angular Fracture, No Staining at 294'			
295		296.0 ft Inter bedded Fine SAND and SHALE with Horizontal Partings 486.6			
		Intermediate to Dark Gray, SHALE			Bottom of Screen at 297'
300					

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Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-2

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
305		Intermediate to Dark Gray, SHALE SHALE Parting at 302'	RC C-3	100 (95)	3.77" Corehole not reamed by 7 7/8" Air Hammer 299'-310' Backfilled with Cuttings
		SHALE Parting at 307'			
		309.0 ft 473.6			
310		310.0 ft Gray, SANDSTONE, Fine 472.6			TD 310'
		End of boring at 310.0 feet			
315					
320					
325					
330					
335					
340					
345					
350					

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-3

Client: Buckeye Brine

Project Name: Buckeye Brine Drilling

Project Number: 185-016

Project Location: 23986 Airport Road Coshocton, OH 43812

Date Started: 12/15/2019

Date Completed: 12/19/2019

CEC Field Representative: Nick Faust

Log Checked By: Roy Stanley

Ground Elevation: 785.22 ft amsl

Casing Elevation: 788.31 ft amsl

Latitude: 40.302185

Longitude: -81.850810

Drilling Contractor: CJ's Well Service

Driller: Anthony Stiltner

Drilling Method: Roller Bit + Air Coring + Air Hammer

Core Size: NA

Backfill: 4" Monitoring Well Installed

Borehole Diameter: 7.88 in

Well Installed: 12/19/2019 Stickup: 3.1 ft

Key: NA

Outer Casing: NA

Monitoring Equipment: NA

Development Method: NA

Results: NA

Yield: NA

Water Levels

- At Drilling: NA
- End of Drilling: NA
- After Drilling: NA
- Temporary Well: NA
- Permanant Well : NA

Notes: 12 ¼" Roller Bit 0'-35' (Mud Fluid)
8" I.D. Thread & Couple Steel Casing 0'-35'
7 7/8" Air Hammer 35'-245' (Logged Cuttings)
NQ Air Coring 245'-306.5'
7 7/8" Air Hammer 245'-306.5' (Reaming)

NA - Not Available; bgs - below ground surface; amsl - above mean sea level

Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine | **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 | **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)
0		Gray, COBBLES, (FILL)		
2.0 ft		783.2		
		Red, CLAY		
15.0 ft		770.2		
		Dark, SHALE	RB	
			AH	

WELL DIAGRAM

- Cement 0'-2.5'
- 12 1/4" Borehole 0'-35'
- 4" Schedule 80 PVC Riser 0'-273'
- 8" I.D Steel Surface Casing 0'-35'
- Surface Casing Backfilled with Cuttings 0'-35'
- Bentonite Grout 2.5'-260'
- 7 7/8" Borehole 35'-306.5'

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MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
55		Dark, SHALE			7 7/8" Borehole 35'-306.5'
60					
65					
70					
75			AH		4" Schedule 80 PVC Riser 0'-273'
		78.0 ft 707.2			
		Gray, Fine to Medium Grained, SANDSTONE, Trace Shale Fragments			
80					Bentonite Grout 2.5'-260'
85					
		90.0 ft 695.2			
90		SHALE			
95					
100					

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MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
105		SHALE			7 7/8" Borehole 35'-306.5'
110		110.0 ft 675.2 SANDSTONE			Bentonite Grout 2.5'-260'
115					
120					
125		125.0 ft 660.2 Black, SHALE	AH		
130					
135					4" Schedule 80 PVC Riser 0'-273'
140					
145					
150					

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MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
155		Black, SHALE			7 7/8" Borehole 35'-306.5'
		Silty SHALE			
160					
165					
170		Sandstone Streak			
175		Making Water (Est. 3 gpm)	AH		4" Schedule 80 PVC Riser 0'-273'
180					Bentonite Grout 2.5'-260'
185					
190					
195					
200					

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MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
205		Black, SHALE				7 7/8" Borehole 35'-306.5'
210						
215		215.0 ft Gray, Fine to Medium Grained, SANDSTONE	570.2			
220				AH		4" Schedule 80 PVC Riser 0'-273'
225						Bentonite Grout 2.5'-260'
230						
235		235.0 ft SHALE	550.2			
240						
245		245.0 ft Begin Coring at 245'	540.2			
		246.0 ft Gray, SANDSTONE AND CONGLOMERATE, Fresh Weathered, Slightly Broken, Very Hard	539.2			
		Gray, SAND AND CONGLOMERATE, Fresh Weathered, Very Broken, Medium				
		248.5 ft Gray, SANDSTONE, Fresh Weathered, Slightly Broken, Very Hard,	536.7			
250						

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MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine | PROJECT NAME Buckeye Brine Drilling

PROJECT NUMBER 185-016 | PROJECT LOCATION 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
		Gray, SANDSTONE, Fresh Weathered, Slightly Broken, Very Hard, Massive			7 7/8" Borehole 35'-306.5'
255		Angular Fracture at 254' Bedded SHALE AND SANDSTONE 254.2' to 254.6'	RC C-1	95 (94)	Bentonite Grout 2.5'-260'
260		Angular Fracture at 262'			Bentonite Pellets 260'-266'
265	265.0 ft	Dark SHALE at 264' to 265'	520.2		4" Schedule 80 PVC Riser 0'-273'
		Gray, SANDSTONE, Fresh Weathered, Slightly Broken, Hard, Massive, Fine			No. 5 Silica Sand 266'-306.5'
270		Angular Fracture at 268' Packer test results (each measurement taken over a 5 min interval): 260'-270' = 2 GAL 10 PSI 3GAL 20 PSI 270'-280' = 1 GAL 10 PSI 5 GAL 20 PSI 280'-290' = 5 GAL 10 PSI 5 GAL 20 PSI 290'-300' = 5 GAL 10 PSI 6 GAL 20 PSI			Top of Screen at 273'
275		Thinly Bedded SHALE at 278' Angular Fractures 276' to 277'	RC C-2	100 (98)	
		Fractured SANDSTONE at 278' to 279'			
280					
285		CONGLOMERATE, Very Broken from 286' to 291'			4" PVC Screen With 0.010 Inch Slots 273'-303'
290		Gray SANDSTONE from 291' to 294'			
295		CONGLOMERATE Seam from 294' to 298'	RC C-3	100 (91)	
	298.5 ft	Dark, SHALE, Slightly Broken, Soft, Medium Bedded	486.7		
300					

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Civil & Environmental Consultants, Inc.
250 W. Old Wilson Bridge Road
Suite 250
Worthington, OH 43085

MONITORING WELL NUMBER MW-3

CLIENT Buckeye Brine **PROJECT NAME** Buckeye Brine Drilling

PROJECT NUMBER 185-016 **PROJECT LOCATION** 23986 Airport Road Coshocton, OH 43812

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	WELL DIAGRAM
305		Dark, SHALE, Slightly Broken, Soft, Medium Bedded	478.7		No. 5 Silica Sand 266'-306.5'
		306.5 ft			Bottom of Screen at 303'
		End of boring at 306.5 feet			TD 306.5'
310					
315					
320					
325					
330					
335					
340					
345					
350					

APPENDIX B

WELL DEVELOPMENT FORMS

WELL DEVELOPMENT FORM

Well # MW-1 pump set at 315' bgs
Diameter (in): 4
Initial Static DTW (ft): 7.20' (TOC)
Total Depth (ft): 325'
Casing Volume (g): ~~203 gals 26.6 gals~~ (RAS) 203 gals.

Date: 12-26-19
Developed By: M. Buck / B. Stanley
Purge Method: Pump
Total Gallons Removed: ~203
Well Volumes Removed: 1 (pumped dry)

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
1219	Initial	7.20	13.3	2090	19.3	3.69	
1224		6.82	13.6	46150	45.5	27.89	Pumping stopped; generator malfunction
1548		7.17	13.7	46321	58.6	?	
1600		7.93	13.5	12960		[redacted]	100' water level tape not working
16:05		—	—	—	—	—	well dry, pumping rate was ~7gpm
12/27/19 16:30		7.19	13.21	44466	23.4	[redacted]	Pumping ~15 gpm.
16:33		7.36	13.10	44772	145.0		
16:36		7.41	13.10	44766	392.0		
16:39		7.45	13.00	44849	279.0		Pumping ~10 gpm
16:42		7.50	13.12	44376	227.0		
16:43		Well Dry					Pumping ~5 gpm

Cal Info
Hach 2100Q

YSI Pro
4.0 = 4.0 10.0 = 10.0

1st 0.66 gal/ft

WELL DEVELOPMENT FORM

Well # MW-2
Diameter (in): 4
Initial Static DTW (ft): 37.09 TOC
Total Depth (ft): 297 BGS
Casing Volume (g): _____

Pump at 280'

See MW-3 for Cal Info's

Date: 27 MAR 12-30-19
Developed By: M. Bach / R. Stanley
Purge Method: _____
Total Gallons Removed: _____
Well Volumes Removed: _____

TOC

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
1248	Initial	7.46	13.9	24659	20.7	26.37	~16gpm
1253		7.58	14.0	25051	25.1	-	~15gpm; pump rate too high to collect water level
1258		7.60	14.2	25367	21.7	-	~9 gpm
1300		-	-	-	-	253.6	Stopped; not enough lift
1337		7.59	14.6	2539	255	189	~3gpm 3gpm
1340		7.66	14.7	24421	50.2	-	
1343		7.72	15.0	24393	42.7	-	
1346		7.72	15.1	24483	49.2	-	
1349		7.74	15.2	24375	70.4	-	
1352		7.76	15.1	24421	87.8	-	
1356		7.75	15.2	24525	121	-	
1401		7.71	15.3	24687	123	-	
1403		-	-	-	-	-	Stopped; not enough lift
1421		7.77	14.9	24677	167	-	~1.5gpm
1424		7.76	14.9	24784	152		
1427		7.79	14.9	24946	86.3		

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WELL DEVELOPMENT FORM

p. 2 of 2

Well # MW-2

Diameter (in): _____

Initial Static DTW (ft): _____

Total Depth (ft): _____

Casing Volume (g): _____

Date: 12-27

Developed By: _____

Purge Method: _____

Total Gallons Removed: _____

Well Volumes Removed: _____

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
1430		7.76	15.1	25154	100		
1433		7.51	15.9	25055	74.4		
1434		7.48	14.8	25140	80.2		
1435							Stopped pump

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WELL DEVELOPMENT FORM

Well # MW-3
Diameter (in): 4
Initial Static DTW (ft): 36.79 (TOC)
Total Depth (ft): 305 (bgs)
Casing Volume (g): _____

Pump at ~300'
~15 gal/min

Date: ~~12-28-19~~ 12-27-19 MB
Developed By: M. Bach / B. Stanley
Purge Method: _____
Total Gallons Removed: _____
Well Volumes Removed: _____

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
0906	Initial	8.09	13.4	3797	547	27.7	Pump rate high; unable to obtain
0911		7.75	13.2	23296	106	-	water level
0914		7.96	13.0	20609	98.3	-	
0917		8.16	13.2	16538	78.7	-	Stopped
0943		7.93	12.6	16162	83.9	144.6	Restarted
0946		7.84	13.2	26860	55.2	-	
0949		7.90	13.3	25959	111	-	Slowed to ~13 gal/min
0952		8.21	13.3	17682	102	-	
0955		8.24	13.3	15760	183	-	
0956		-	-	-	-	276	Stopped; no light; let recover to 230'
1009		7.71	13.4	16096	262	230	~7 gpm
1012		7.92	13.2	15707	45.4	-	~3 gpm
1017		7.99	14.1	26228	38.6	-	
1022		8.04	14.1	26195	24.8		
1027		8.06	14.0	26180	31.5		
1032		8.09	14.0	26157	26.1		

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Cal Info
Hach 2100Q

YSI Pro
4.0 = 4.0 16.0 = 16.0

WELL DEVELOPMENT FORM

Well # MW-3

Diameter (in): 4

Initial Static DTW (ft): 26.79 TOC

Total Depth (ft): 305 bgs

Casing Volume (g): _____

12-27-19

Date: ~~12-28-19~~ MB

Developed By: M. Bach / B. Stanley

Purge Method: _____

Total Gallons Removed: _____

Well Volumes Removed: _____

Time	Purged	pH	(°C)	(uS)	Turb.	DTW	Comments
1033		~~7.98~~	~~13.4~~	~~26029~~	~~90.7~~	-	Back to ~~15~~ 10 gpm
1036		7.98	13.4	26029	90.7	-	
1037		-	-	-	-		Stopped; no lift

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APPENDIX C

FIELD DATA SHEETS

GROUNDWATER MONITORING WELL SAMPLING FIELD DATA SHEET

Client: Buckeye Brine | CEC Project Number: _____

Date: 12-28-19 | Weather Observations: 41°, Overcast

WELL ID: MW-1

Water Volume Factors	
Diameter	Gallons/Foot
1 inches	0.04
1.5 inches	0.092
2 inches	0.17
3 inches	0.38
4 inches	0.66

Casing Diameter: 4 (inches) | Water Height in Well: _____ (feet)

Total Depth: 325 (feet) BGS | Water Volume in Well: _____ (gallons)

Depth to Water: 29.90 (feet) TOC | Purge Volume: _____ gal.(calculated)

Depth to Top of Screen: 285 (feet) BGS | _____ gal. (removed) mc

Min. Purge Vol. for Passive Sampling ((tubing)(ml/ft)+(pump Vol.)) = -

Measured using: Electric water level tape.

Purged using: Bailer/Polypro Rope | Dedicated Bladder pump/poly tubing (non) | Other -

Sampled using: Bailer/Polypro Rope | Dedicated Bladder pump/poly tubing (non) | Other -

P:\Project Documents\APEX LPW\W Sampling Events\Phase 2 Background Sampling\Background 4-6-3

Field Measurements

Temperature (degrees C)	pH (s.u.)	Conductivity (umhos/cm)	Turbidity (NTU)	Volume (gallons) mc	Water Level During Purging (feet)	Time
12.0	6.89	44342	35.4	Initial	26.72	1020
11.0	6.96	45307	4.89	2000	27.88	1025
11.6	6.98	45447	3.39	4000	28.32	1030
11.9	7.01	45491	1.50	6000	28.80	1035

Field Measurements at Time of Sampling

Temperature (degrees C)	pH (s.u.)	Conductivity (umhos/cm)	Turbidity (NTU)	Volume (gallons) mc	Water Level During Sampling (feet)	Time
11.9	7.01	45491	1.50	6000	28.80	1035

Instrument Calibration

See MW-2 for Cal Info

Turbidity Meter Type _____

1.0 NTU std = _____ | 5.94 NTU std = _____

10.0 NTD std = _____ | 49.6 NTU std = _____

505 NTU std = _____

pH/Conductivity Meter Type _____

4.01 std = _____

7.0 std = _____ | 1413 umhos/cm = _____

10.1 std = _____

Physical Properties

Odor: None

Color: Clear

Turbidity: Low

Analysis Required: _____

Sample time/date: 12-28-19 1035

Description of Flow: Ser pump at 305'; 10/20 @ 200psi = 400 mL/min

Deviations from SAP: Collected EBB here at 1136

Sampler: _____ Signature: _____

GROUNDWATER MONITORING WELL SAMPLING FIELD DATA SHEET

Client: Buckeye Brine | CEC Project Number: _____

Date: 12-28-19 | Weather Observations: 37° . Cloudy

WELL ID: MW-2

Water Volume Factors	
Diameter	Gallons/Foot
1 inches	0.04
1 5 inches	0 092
2 inches	0.17
3 inches	0.38
4 inches	0 66

Casing Diameter: 4 (inches) | Water Height in Well: _____ (feet)

Total Depth: ~~299~~ 297 (feet) BGS | Water Volume in Well: _____ (gallons)

Depth to Water: 38.50 (feet) TOC | Purge Volume: _____ gal (calculated)

Depth to Top of Screen: 277 (feet) BGS | _____ gal. (removed) mL

Min. Purge Vol. for Passive Sampling ((tubing)(ml/ft)+(pump Vol.)) = -

Measured using: Electric water level tape.

Purged using: Bailer/Polypro Rope | ~~Dedicated Bladder pump/poly tubing~~ Non | Other -

Sampled using: Bailer/Polypro Rope | ~~Dedicated Bladder pump/poly tubing~~ Non | Other -

Field Measurements

Temperature (degrees C)	pH (s.u.)	Conductivity (umhos/cm)	Turbidity (NTU)	Volume ~~(gallons)~~ mL	Water Level During Purging (feet)	Time
13.3	7.07	24764	11.5	Initial	38.13	0837
13.3	7.07	24199	2.27	2600	38.17	0842
13.4	7.08	24200	2.07	5000	38.21	0847
13.4	7.09	24208	2.29	7500	40.3	0852

Field Measurements at Time of Sampling

Temperature (degrees C)	pH (s.u.)	Conductivity (umhos/cm)	Turbidity (NTU)	Volume ~~(gallons)~~ mL	Water Level During Sampling (feet)	Time
13.4	7.09	24208	2.29	7500	40.30	0852

Instrument Calibration

Turbidity Meter Type Hach 2100Q

1.0 NTU std = -
10.0 NTD std = 10.1
5.94 NTU std = -
49.6 NTU std = -
505 NTU std = -

pH/Conductivity Meter Type YSI Pro Plus

4.01 std = 4.0
7.0 std = 7.0
10.1 std = 10.0
1413 umhos/cm = 1413

Physical Properties

Odor: _____
Color: _____
Turbidity: _____

Analysis Required: _____

Sample time/date: 12-28-19 0852

Description of Flow: Set pump at 287' ; ~120@ 200psi = 500mL/min

Deviations from SAP: Collected Field Dup here

Sampler: _____ Signature: _____

CEC

GROUNDWATER MONITORING WELL SAMPLING FIELD DATA SHEET

Client: Buckeye Brine CEC Project Number:

Date: 12-28-19 (27 MB) Weather Observations: 57', Cloudy

WELL ID: MW-3

Water Volume Factors	
Diameter	Gallons/Foot
1 inches	0.04
1.5 inches	0.092
2 inches	0.17
3 inches	0.38
4 inches	0.66

Casing Diameter: 4 (inches) Water Height in Well: ______ (feet)

Total Depth: 305 (feet) BGS Water Volume in Well: ______ (gallons)

Depth to Water: 53.62 (feet) TOC Purge Volume: ______ gal (calculated)

______ ~~gal~~ ml (removed) –

Depth to Top of Screen: 265 (feet) BGS

Min. Purge Vol. for Passive Sampling ((tubing)(ml/ft)+(pump Vol.)) = –

Measured using: Electric water level tape

Purged using: Bailer/Polypro Rope (Non) Dedicated Bladder pump/poly tubing (circled) Other –

Sampled using: Bailer/Polypro Rope (Non) Dedicated Bladder pump/poly tubing (circled) Other –

Field Measurements

Temperature (degrees C)	pH (s.u.)	Conductivity (umhos/cm)	Turbidity (NTU)	Volume (~~gallons~~ ml)	Water Level During Purging (feet)	Time
12.9	7.63	2097	~~[illegible]~~	Initial	53.62	1551
12.7	7.74	26345	3.85	2500	50.20	1556
12.7	7.77	26339	4.80	5000	50.44	~~[illegible]~~ 1601
12.7	7.79	26368	2.67	7500	50.44	1606

Field Measurements at Time of Sampling

Temperature (degrees C)	pH (s.u.)	Conductivity (umhos/cm)	Turbidity (NTU)	Volume (~~gallons~~ ml)	Water Level During Sampling (feet)	Time
12.7	7.79	26368	2.67	7500	50.44	1606

Instrument Calibration

Turbidity	Meter Type Hach 2100Q	1.0 NTU std = – 10.0 NTD std = 9.55	5.94 NTU std = – 49.6 NTU std = – 505 NTU std = –
pH/Conductivity	Meter Type YSI Pro Plus	4.01 std = 4.0 7.0 std = 7.0 10.1 std = 10.0	1413 umhos/cm = 1413

Physical Properties

Odor: None

Color: Clear

Turbidity: Low

Analysis Required: ______

Sample time/date: 12-28-19 (27 MB) 1606

Description of Flow: Set pump at 285' TOC, 10/20 @ 200psi = 500mL/min

Deviations from SAP: ______

Sampler: ______ Signature: ______

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APPENDIX D

LABORATORY ANALYTICAL REPORTS

GEOCHEMICAL TESTING
Environmental and Energy Analysis

2005 N. Center Ave.
Somerset, PA 15501

814/443-1671
814/445-6666
FAX: 814/445-6729

Tuesday, January 21, 2020

Roy Stanley
CIVIL & ENVIRONMENTAL-COLUMBUS
250 W OLD WILSON BRIDGE ROAD
WORTHINGTON, OH 43085

RE: Buckeye Brine Injection Facility Order No.: G1912F78

Dear Roy Stanley:

Geochemical Testing received 3 sample(s) on 12/31/2019 for the analyses presented in the following report.

There were no problems with sample receipt protocols and analyses met the TNI/NELAC, EPA, and laboratory specifications except where noted in the Case Narrative or Laboratory Results.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Timothy W. Bergstresser
Director of Technical Services

Leslie A. Nemeth
Project Manager

ACCREDITED IN ACCORDANCE WITH nelac
I.D. 56-00306PA DEP

Geochemical Testing

Date: *21-Jan-20*

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Project: Buckeye Brine Injection Facility
Lab Order: G1912F78

CASE NARRATIVE

No problems were encountered during analysis of this workorder, except if noted in this report.

Legend:

H - Method Hold Time exceeded and is not compliant with 40CFR136 Table II.
U - The analyte was not detected at or above the listed concentration, which is below the laboratory quantitation limit.
B - Analyte detected in the associated Method Blank
Q1 - See case narrative ND - Not Detected
MCL - Contaminant Limit J - Indicates an estimated value.
Q - Qualifier QL -Quantitation Limit DF - Dilution Factor
S - Surrogate Recovery outside accepted recovery limits
T - Sample received above required temperature and is not compliant with 40CFR136 Table II.
T1 - Sample received above required temperature
MDA - Minimum Detectable Activity.
** - Value exceeds Action Limit
TICs - Tentatively Identified Compounds.
E - Value above quantitation range

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Field Dup
Lab Order:	G1912F78		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F78-001	**Collection Date:**	12/28/2019 12:00:01 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:00 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
PHYSICAL TESTS		Analyst: **AMV**					**EPA 120.1**
Specific Conductance	26300	5		µmhos/cm	1		01/02/20 8:42 AM
PH BY SM 4500 H+B		Analyst: **AMV**					**SM 4500-H+ B**
Lab pH	7.68		H	S.U.	1		01/02/20 8:42 AM
INORGANIC NON-METALS		Analyst: **GMG**				**SM 2540C**	**SM 2540 C**
Total dissolved solids	15400	100		mg/L	5	12/31/19 3:10 PM	12/31/19 3:19 PM
INORGANIC NON-METALS		Analyst: **MBG**				**EPA 300.0**	**EPA 300.0**
Chloride	10200	10		mg/L	10	01/02/20 3:25 PM	01/02/20 9:54 PM
Fluoride	< 0.1	0.1		mg/L	1	12/31/19 2:10 PM	12/31/19 5:08 PM
INORGANIC NON-METALS		Analyst: **JMS**					**EPA 350.1**
Ammonia Nitrogen	7.92	0.50		mg/L as N	5		01/03/20 1:56 PM
INORGANIC METALS		Analyst: **JEK**				**EPA 3010 A**	**EPA 6010**
Boron	1.42	0.05		mg/L	1	01/02/20 8:05 AM	01/09/20 11:29 AM
Calcium	165	0.10		mg/L	1	01/02/20 8:05 AM	01/02/20 3:52 PM
Iron	0.39	0.05		mg/L	1	01/02/20 8:05 AM	01/02/20 3:52 PM
Manganese	0.081	0.010		mg/L	1	01/02/20 8:05 AM	01/02/20 3:52 PM
Potassium	42.3	0.5		mg/L	1	01/02/20 8:05 AM	01/02/20 3:52 PM
VOLATILE ORGANIC COMPOUNDS		Analyst: **SJM**					**EPA 8260 B**
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 4:21 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 4:21 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 4:21 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Field Dup
Lab Order:	G1912F78		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F78-001	**Collection Date:**	12/28/2019 12:00:01 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:00 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: **SJM**					**EPA 8260 B**
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Acetone	< 10	10		µg/L	1		12/31/19 4:21 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 4:21 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 4:21 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:21 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 4:21 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:21 PM
Surr: 1,2-Dichloroethane-d4	96.9	70-130		%REC	1		12/31/19 4:21 PM
Surr: 4-Bromofluorobenzene	98.4	70-130		%REC	1		12/31/19 4:21 PM
Surr: Dibromofluoromethane	98.7	70-130		%REC	1		12/31/19 4:21 PM
Surr: Toluene-d8	102	70-130		%REC	1		12/31/19 4:21 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Rinsate Blank
Lab Order:	G1912F78		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F78-002	**Collection Date:**	12/28/2019 11:36:00 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:00 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
PHYSICAL TESTS		Analyst: **AMV**					**EPA 120.1**
Specific Conductance	6	5		µmhos/cm	1		01/02/20 8:45 AM
PH BY SM 4500 H+B		Analyst: **AMV**					**SM 4500-H+ B**
Lab pH	5.67		H	S.U.	1		01/02/20 8:45 AM
INORGANIC NON-METALS		Analyst: **GMG**				**SM 2540C**	**SM 2540 C**
Total dissolved solids	< 20	20		mg/L	1	12/31/19 3:10 PM	12/31/19 3:19 PM
INORGANIC NON-METALS		Analyst: **MBG**				**EPA 300.0**	**EPA 300.0**
Chloride	< 1.0	1.0		mg/L	1	12/31/19 2:10 PM	12/31/19 6:01 PM
Fluoride	< 0.1	0.1		mg/L	1	12/31/19 2:10 PM	12/31/19 6:01 PM
INORGANIC NON-METALS		Analyst: **JMS**					**EPA 350.1**
Ammonia Nitrogen	< 0.10	0.10		mg/L as N	1		01/03/20 1:58 PM
INORGANIC METALS		Analyst: **JEK**				**EPA 3010 A**	**EPA 6010**
Boron	< 0.05	0.05		mg/L	1	01/02/20 8:05 AM	01/09/20 2:26 PM
Calcium	0.13	0.10		mg/L	1	01/02/20 8:05 AM	01/02/20 4:24 PM
Iron	< 0.05	0.05		mg/L	1	01/02/20 8:05 AM	01/02/20 4:24 PM
Manganese	< 0.010	0.010		mg/L	1	01/02/20 8:05 AM	01/02/20 4:24 PM
Potassium	< 0.5	0.5		mg/L	1	01/02/20 8:05 AM	01/02/20 4:24 PM
VOLATILE ORGANIC COMPOUNDS		Analyst: **SJM**					**EPA 8260 B**
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 4:44 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 4:44 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 4:44 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Rinsate Blank
Lab Order:	G1912F78		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F78-002	**Collection Date:**	12/28/2019 11:36:00 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:00 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: **SJM**					**EPA 8260 B**
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Acetone	< 10	10		µg/L	1		12/31/19 4:44 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 4:44 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 4:44 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:44 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 4:44 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:44 PM
Surr: 1,2-Dichloroethane-d4	94.3	70-130		%REC	1		12/31/19 4:44 PM
Surr: 4-Bromofluorobenzene	98.7	70-130		%REC	1		12/31/19 4:44 PM
Surr: Dibromofluoromethane	98.1	70-130		%REC	1		12/31/19 4:44 PM
Surr: Toluene-d8	104	70-130		%REC	1		12/31/19 4:44 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Trip Blank
Lab Order:	G1912F78		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F78-003	**Collection Date:**	12/31/2019 12:56:00 P
Matrix:	AQUEOUS	**Received Date:**	12/31/2019 12:57:00 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: JAW					EPA 8260 B
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 2:34 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 2:34 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 2:34 PM
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Acetone	< 10	10		µg/L	1		12/31/19 2:34 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 2:34 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 2:34 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Trip Blank
Lab Order:	G1912F78		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F78-003	**Collection Date:**	12/31/2019 12:56:00 P
Matrix:	AQUEOUS	**Received Date:**	12/31/2019 12:57:00 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 2:34 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 2:34 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 2:34 PM
Surr: 1,2-Dichloroethane-d4	126	70-130		%REC	1		12/31/19 2:34 PM
Surr: 4-Bromofluorobenzene	93.8	70-130		%REC	1		12/31/19 2:34 PM
Surr: Dibromofluoromethane	126	70-130		%REC	1		12/31/19 2:34 PM
Surr: Toluene-d8	96.1	70-130		%REC	1		12/31/19 2:34 PM

Form F-5079, 01.15

Geochemical Testing G1912F7X

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Chain of Custody (COC) for State of Ohio

Shuttle/Cooler ID# 86

Landfill Site	GT Quote No.	Client Job No	Date Results Required
Buckeye Brine		185-016	Std

REPORT RESULTS TO:

Name	Title	Mailing Address
Ray Stanley	SPM	250 W. Old Wilson Bridge Rd
Company	Dept.	City, State, Zip
CEC		Worthington, OH 43085
Telephone No.	E-mail Address	
614-540-6633	rstanley@ceainc.com	

Special Instructions:

See Table 1 for Analysis

ANALYSIS REQUESTED

Enter 'X' in box below to indicate request

CLIENT SAMPLE ID	DATE SAMPLED	TIME (24 hr)	COMP	GRAB	SAMPLE TYPE (MATRIX)	Number of Containers	Appendix I: Ammonia-N Preservative: 1:1 H_2SO_4	Appendix I: Total Metals Preservative: 1:1 HNO_3	Appendix I: Alkalinity Preservative: NONE	Appendix I: Chloride, NO_3+NO_2, Sulfate Preservative: NONE	Appendix I: TDS (Lab Filtered) Preservative: NONE	Appendix I: EDB/DBCP Preservative: 1:1 HCl	Appendix I: VOC Preservative: 1:1 HCl	Appendix II: Semivolatiles (EPA 8270) Preservative: NONE	Appendix II: Pest/PCB/Hexachlorobenzene Preservative: NONE	Appendix II: Herbicides Preservative: NONE	Appendix II: Sulfide Preservative: NaOH Zinc acetate	Appendix II: Cyanide Preservative: NaOH	Other Analysis:	Lab Use Only: Lab Number
Field Dup	12-28-19	-		X	GW	7	X	X		X	X		X							001
Rinsate Blank	12-28-19	1136		X	GW	7	X	X		X	X		X							002
Trip Blank	-	-	-	-	WT	4							X							003

SR 1st Review: MF

CS 2nd Review: 1

CHAIN OF CUSTODY			
	Relinquished by:	Date/Time: 12-30-19	Received by:
	Relinquished by:	Date/Time:	Received at lab by:
	Method of Shipment:		Comments: Soil

Date/Time: 12-31-19 1257

Authorized by: Mallory Bry (Client Signature MUST Accompany Request) Date 12-30-19

Ice present on receipt: X Yes or ___ No

Cooler Temp (°C) on receipt: 2

Please return completed form and samples to **Geochemical Testing • 2005 N Center Ave • Somerset, PA • 15501** • 814-443-1671 • (Fax: 814-445-6729)

Table 1

ANALYTICAL PROGRAM
Buckeye Brine Injection Facility
Keene Township
Coshocton County, Ohio

Analytical Program

Matrix	Analyte	Analytical Method [1]
Groundwater Sample	Ammonia	EPA 350.1
	Boron	EPA 6010B
	Calcium	EPA 6010B
	Chloride	SM4500 CIE
	Fluoride	SM4500 FC
	Iron	EPA 6010B
	Manganese	EPA 6010B
	pH	pH Meter / YSI Pro
	Potassium	EPA 6010B
	Specific Conductance	Conductivity Meter / YSI Pro
	Temperature	Temperature Probe / YSI Pro
	Total Dissolved Solids	SM2540C
	VOCs [2]	
	1,2,5-Trimethylbenzene	GCMS (EPA 8260B)
	1,3,5-Trimethylbenzene	GCMS (EPA 8260B)
	1,1,1-Trichloroethane (Methyl Chloroform)	GCMS (EPA 8260B)
	1,1,2,2-Tetrachloroethane	GCMS (EPA 8260B)
	1,1,2-Trichloro-1,2,2-trifluoroethane	GCMS (EPA 8260B)
	1,1,2-Trichloroethane	GCMS (EPA 8260B)
	1,1-Dichloroethane	GCMS (EPA 8260B)
	1,1-Dichloroethene (1,1-Dichloroethylene)	GCMS (EPA 8260B)
	1,2,4-Trichlorobenzene	GCMS (EPA 8260B)
	1,2-Dibromo-3-chloropropane	GCMS (EPA 8260B)
	1,2-Dibromoethane (Ethylene Dibromide)	GCMS (EPA 8260B)
	1,2-Dichlorobenzene	GCMS (EPA 8260B)
	1,2-Dichloroethane	GCMS (EPA 8260B)
	1,2-Dichloropropane	GCMS (EPA 8260B)
	1,3-Dichlorobenzene	GCMS (EPA 8260B)
	1,4-Dichlorobenzene (p-Dichlorobenzene)	GCMS (EPA 8260B)
	2-Butanone (Methyl Ethyl Ketone)	GCMS (EPA 8260B)
	2-Hexanone (Methyl n-Butyl Ketone)	GCMS (EPA 8260B)
	4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	GCMS (EPA 8260B)
	Acetone	GCMS (EPA 8260B)
	Benzene	GCMS (EPA 8260B)

Table 1

ANALYTICAL PROGRAM
Buckeye Brine Injection Facility
Keene Township
Coshocton County, Ohio

Analytical Program

Matrix	Analyte	Analytical Method [1]
Groundwater Sample	Bromodichloromethane	GCMS (EPA 8260B)
	Bromoform (Tribromomethane)	GCMS (EPA 8260B)
	Bromomethane (Methyl Bromide)	GCMS (EPA 8260B)
	Carbon disulfide	GCMS (EPA 8260B)
	Carbon tetrachloride	GCMS (EPA 8260B)
	Chlorobenzene	GCMS (EPA 8260B)
	Chloroethane (Ethyl Chloride)	GCMS (EPA 8260B)
	Chloroform	GCMS (EPA 8260B)
	Chloromethane (Methyl Chloride)	GCMS (EPA 8260B)
	cis-1,2-Dichloroethene	GCMS (EPA 8260B)
	cis-1,3-Dichloropropene	GCMS (EPA 8260B)
	Cyclohexane	GCMS (EPA 8260B)
	Dibromochloromethane (Chlorodibromomethane)	GCMS (EPA 8260B)
	Dichlorodifluoromethane (Freon 12)	GCMS (EPA 8260B)
	Ethylbenzene	GCMS (EPA 8260B)
	Isopropylbenzene (Cumene)	GCMS (EPA 8260B)
	Methyl acetate	GCMS (EPA 8260B)
	Methyl tert-butyl ether (MTBE)	GCMS (EPA 8260B)
	Methylcyclohexane	GCMS (EPA 8260B)
	Methylene chloride (Dichloromethane)	GCMS (EPA 8260B)
	Styrene	GCMS (EPA 8260B)
	Tetrachloroethene (PCE)	GCMS (EPA 8260B)
	Toluene	GCMS (EPA 8260B)
	trans-1,2-Dichloroethene (trans-1,2-Dichloroethylene)	GCMS (EPA 8260B)
	trans-1,3-Dichloropropene	GCMS (EPA 8260B)
	Trichloroethene (Trichloroethylene) (TCE)	GCMS (EPA 8260B)
	Trichlorofluoromethane (Fluorotrichloromethane) (Freon 11)	GCMS (EPA 8260B)
	Vinyl chloride	GCMS (EPA 8260B)
	Xylenes (total)	GCMS (EPA 8260B)

Notes:

[1] All analyses will be performed using U.S. EPA analytical methods from the following:

Third Edition (September 1986), as amended by updates I (July 1992), II (September 1994), IIA (August 1993), and IIB (January 1995), or the most current SW-846 update;

EPA's "Handbook for Analytical Quality Control in Water and Wastewater Laboratories" (EPA 600/1-79-019); and

Standard Methods for the Examination of Water and Wastewater.

2 For Initial Round of Sampling Only

GEOCHEMICAL TESTING
Environmental and Energy Analysis

2005 N. Center Ave.
Somerset, PA 15501

814/443-1671
814/445-6666
FAX: 814/445-6729

Tuesday, January 21, 2020

Roy Stanley
CIVIL & ENVIRONMENTAL-COLUMBUS
250 W OLD WILSON BRIDGE ROAD
WORTHINGTON, OH 43085

RE: Buckeye Brine Injection Facility Order No.: G1912F79

Dear Roy Stanley:

Geochemical Testing received 5 sample(s) on 12/31/2019 for the analyses presented in the following report.

There were no problems with sample receipt protocols and analyses met the TNI/NELAC, EPA, and laboratory specifications except where noted in the Case Narrative or Laboratory Results.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Timothy W Bergstresser

Timothy W. Bergstresser
Director of Technical Services

Leslie A. Nemeth
Project Manager

ACCREDITED IN ACCORDANCE WITH nelac
I.D. 56-00306PA DEP

Geochemical Testing

Date: *21-Jan-20*

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Project: Buckeye Brine Injection Facility
Lab Order: G1912F79

CASE NARRATIVE

No problems were encountered during analysis of this workorder, except if noted in this report.

Legend:

H - Method Hold Time exceeded and is not compliant with 40CFR136 Table II.
U - The analyte was not detected at or above the listed concentration, which is below the laboratory quantitation limit.
B - Analyte detected in the associated Method Blank
Q1 - See case narrative ND - Not Detected
MCL - Contaminant Limit J - Indicates an estimated value.
Q - Qualifier QL -Quantitation Limit DF - Dilution Factor
S - Surrogate Recovery outside accepted recovery limits
T - Sample received above required temperature and is not compliant with 40CFR136 Table II.
T1 - Sample received above required temperature
MDA - Minimum Detectable Activity.
** - Value exceeds Action Limit
TICs - Tentatively Identified Compounds.
E - Value above quantitation range

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-3
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-001	**Collection Date:**	12/27/2019 4:06:00 PM
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
PHYSICAL TESTS		Analyst: **AMV**					**EPA 120.1**
Specific Conductance	28900	5		µmhos/cm	1		01/02/20 8:48 AM
PH BY SM 4500 H+B		Analyst: **AMV**					**SM 4500-H+ B**
Lab pH	7.68		H	S.U.	1		01/02/20 8:48 AM
INORGANIC NON-METALS		Analyst: **GMG**				**SM 2540C**	**SM 2540 C**
Total dissolved solids	16800	100		mg/L	5	12/31/19 3:10 PM	12/31/19 3:19 PM
INORGANIC NON-METALS		Analyst: **MBG**				**EPA 300.0**	**EPA 300.0**
Chloride	12000	10		mg/L	10	01/02/20 3:25 PM	01/02/20 10:12 PM
Fluoride	< 0.1	0.1		mg/L	1	12/31/19 2:10 PM	12/31/19 6:19 PM
INORGANIC NON-METALS		Analyst: **JMS**					**EPA 350.1**
Ammonia Nitrogen	8.72	0.50		mg/L as N	5		01/03/20 2:00 PM
INORGANIC METALS		Analyst: **JEK**				**EPA 3010 A**	**EPA 6010**
Boron	1.37	0.050		mg/L	1	01/02/20 8:05 AM	01/09/20 11:35 AM
Calcium	196	0.100		mg/L	1	01/02/20 8:05 AM	01/02/20 4:28 PM
Iron	0.531	0.050		mg/L	1	01/02/20 8:05 AM	01/02/20 4:28 PM
Manganese	0.069	0.010		mg/L	1	01/02/20 8:05 AM	01/02/20 4:28 PM
Potassium	43.0	0.500		mg/L	1	01/02/20 8:05 AM	01/02/20 4:28 PM
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 2:59 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 2:59 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 2:59 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-3
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-001	**Collection Date:**	12/27/2019 4:06:00 PM
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Acetone	< 10	10		µg/L	1		12/31/19 2:59 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 2:59 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 2:59 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 2:59 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 2:59 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 2:59 PM
Surr: 1,2-Dichloroethane-d4	127	70-130		%REC	1		12/31/19 2:59 PM
Surr: 4-Bromofluorobenzene	92.5	70-130		%REC	1		12/31/19 2:59 PM
Surr: Dibromofluoromethane	128	70-130		%REC	1		12/31/19 2:59 PM
Surr: Toluene-d8	96.7	70-130		%REC	1		12/31/19 2:59 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-2
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-002	**Collection Date:**	12/28/2019 8:52:00 AM
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
PHYSICAL TESTS		Analyst: **AMV**					**EPA 120.1**
Specific Conductance	26500	5		µmhos/cm	1		01/02/20 8:50 AM
PH BY SM 4500 H+B		Analyst: **AMV**					**SM 4500-H+ B**
Lab pH	7.73		H	S.U.	1		01/02/20 8:50 AM
INORGANIC NON-METALS		Analyst: **GMG**				**SM 2540C**	**SM 2540 C**
Total dissolved solids	15300	100		mg/L	5	12/31/19 3:10 PM	12/31/19 3:19 PM
INORGANIC NON-METALS		Analyst: **MBG**				**EPA 300.0**	**EPA 300.0**
Chloride	9640	10		mg/L	10	01/02/20 3:25 PM	01/02/20 11:06 PM
Fluoride	< 0.1	0.1		mg/L	1	12/31/19 2:10 PM	12/31/19 7:13 PM
INORGANIC NON-METALS		Analyst: **JMS**					**EPA 350.1**
Ammonia Nitrogen	7.49	0.50		mg/L as N	5		01/03/20 2:02 PM
INORGANIC METALS		Analyst: **JEK**				**EPA 3010 A**	**EPA 6010**
Boron	1.41	0.050		mg/L	1	01/02/20 8:05 AM	01/09/20 11:36 AM
Calcium	164	0.100		mg/L	1	01/02/20 8:05 AM	01/02/20 4:33 PM
Iron	0.380	0.050		mg/L	1	01/02/20 8:05 AM	01/02/20 4:33 PM
Manganese	0.080	0.010		mg/L	1	01/02/20 8:05 AM	01/02/20 4:33 PM
Potassium	38.2	0.500		mg/L	1	01/02/20 8:05 AM	01/02/20 4:33 PM
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 3:25 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 3:25 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 3:25 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-2
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-002	**Collection Date:**	12/28/2019 8:52:00 AM
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Acetone	< 10	10		µg/L	1		12/31/19 3:25 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 3:25 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 3:25 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 3:25 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 3:25 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 3:25 PM
Surr: 1,2-Dichloroethane-d4	128	70-130		%REC	1		12/31/19 3:25 PM
Surr: 4-Bromofluorobenzene	94.0	70-130		%REC	1		12/31/19 3:25 PM
Surr: Dibromofluoromethane	127	70-130		%REC	1		12/31/19 3:25 PM
Surr: Toluene-d8	96.1	70-130		%REC	1		12/31/19 3:25 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-1
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-003	**Collection Date:**	12/28/2019 10:35:00 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
PHYSICAL TESTS		Analyst: **AMV**					**EPA 120.1**
Specific Conductance	48600	5		µmhos/cm	1		01/02/20 8:53 AM
PH BY SM 4500 H+B		Analyst: **AMV**					**SM 4500-H+ B**
Lab pH	7.35		H	S.U.	1		01/02/20 8:53 AM
INORGANIC NON-METALS		Analyst: **GMG**				**SM 2540C**	**SM 2540 C**
Total dissolved solids	31000	100		mg/L	5	12/31/19 3:10 PM	12/31/19 3:19 PM
INORGANIC NON-METALS		Analyst: **MBG**				**EPA 300.0**	**EPA 300.0**
Chloride	20700	25.0		mg/L	25	01/02/20 3:25 PM	01/02/20 11:23 PM
Fluoride	< 0.1	0.1		mg/L	1	12/31/19 2:10 PM	12/31/19 7:31 PM
INORGANIC NON-METALS		Analyst: **JMS**					**EPA 350.1**
Ammonia Nitrogen	13.6	0.50		mg/L as N	5		01/03/20 2:04 PM
INORGANIC METALS		Analyst: **JEK**				**EPA 3010 A**	**EPA 6010**
Boron	1.24	0.050		mg/L	1	01/02/20 8:05 AM	01/09/20 11:38 AM
Calcium	545	0.100		mg/L	1	01/02/20 8:05 AM	01/02/20 4:38 PM
Iron	2.23	0.050		mg/L	1	01/02/20 8:05 AM	01/02/20 4:38 PM
Manganese	0.189	0.010		mg/L	1	01/02/20 8:05 AM	01/02/20 4:38 PM
Potassium	82.3	0.500		mg/L	1	01/02/20 8:05 AM	01/02/20 4:38 PM
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,2,3-Trimethylbenzene	< 1.0	1.0	M2	µg/L	1		12/31/19 3:51 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 3:51 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,2-Dichlorobenzene	< 1.0	1.0	M2	µg/L	1		12/31/19 3:51 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,3,5-Trimethylbenzene	< 1.0	1.0	M2	µg/L	1		12/31/19 3:51 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 3:51 PM
2-Hexanone	< 5.0	5.0	M1	µg/L	1		12/31/19 3:51 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-1
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-003	**Collection Date:**	12/28/2019 10:35:00 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: JAW					EPA 8260 B
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Acetone	< 10	10		µg/L	1		12/31/19 3:51 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Chlorobenzene	< 1.0	1.0	M2	µg/L	1		12/31/19 3:51 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 3:51 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 3:51 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 3:51 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 3:51 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 3:51 PM
Surr: 1,2-Dichloroethane-d4	130	70-130		%REC	1		12/31/19 3:51 PM
Surr: 4-Bromofluorobenzene	94.1	70-130		%REC	1		12/31/19 3:51 PM
Surr: Dibromofluoromethane	129	70-130		%REC	1		12/31/19 3:51 PM
Surr: Toluene-d8	95.3	70-130		%REC	1		12/31/19 3:51 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	MW-1
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-003	**Collection Date:**	12/28/2019 10:35:00 A
Matrix:	GROUNDWATER	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: JAW					EPA 8260 B

NOTES:
M1 - MS recovery above the acceptance limits.

M2 - MS recovery below the acceptance limits.

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Trip Blank
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-004	**Collection Date:**	12/31/2019 12:56:00 P
Matrix:	AQUEOUS	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: JAW					EPA 8260 B
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 4:17 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 4:17 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 4:17 PM
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Acetone	< 10	10		µg/L	1		12/31/19 4:17 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 4:17 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 4:17 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Trip Blank
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-004	**Collection Date:**	12/31/2019 12:56:00 P
Matrix:	AQUEOUS	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: JAW					EPA 8260 B
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:17 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 4:17 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:17 PM
Surr: 1,2-Dichloroethane-d4	129	70-130		%REC	1		12/31/19 4:17 PM
Surr: 4-Bromofluorobenzene	93.9	70-130		%REC	1		12/31/19 4:17 PM
Surr: Dibromofluoromethane	130	70-130		%REC	1		12/31/19 4:17 PM
Surr: Toluene-d8	96.2	70-130		%REC	1		12/31/19 4:17 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Trip Blank 2
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-005	**Collection Date:**	12/31/2019 12:56:00 P
Matrix:	AQUEOUS	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: JAW					EPA 8260 B
1,1,1-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,1,2,2-Tetrachloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,1,2-Trichloro-1,2,2-Trifluoroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,1,2-Trichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,1-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,1-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,2,3-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,2,4-Trichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,2-Dibromo-3-chloropropane	< 5.0	5.0		µg/L	1		12/31/19 4:43 PM
1,2-Dibromoethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,2-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,2-Dichloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,2-Dichloropropane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,3,5-Trimethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,3-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
1,4-Dichlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
2-Butanone	< 5.0	5.0		µg/L	1		12/31/19 4:43 PM
2-Hexanone	< 5.0	5.0		µg/L	1		12/31/19 4:43 PM
4-Methyl-2-Pentanone	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Acetone	< 10	10		µg/L	1		12/31/19 4:43 PM
Benzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Bromodichloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Bromoform	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Bromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Carbon Disulfide	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Carbon Tetrachloride	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Chlorobenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Chlorodibromomethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Chloroethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Chloroform	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Chloromethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
cis-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
cis-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Cyclohexane	< 5.0	5.0		µg/L	1		12/31/19 4:43 PM
Dichlorodifluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Ethylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Isopropylbenzene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Methyl Acetate	< 10	10		µg/L	1		12/31/19 4:43 PM
Methylcyclohexane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Methylene Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM

Laboratory Results

Geochemical Testing

Date: *21-Jan-20*

CLIENT:	CIVIL & ENVIRONMENTAL-COLUMBUS	**Client Sample ID:**	Trip Blank 2
Lab Order:	G1912F79		
Project:	Buckeye Brine Injection Facility	**Sampled By:**	CEC Inc
Lab ID:	G1912F79-005	**Collection Date:**	12/31/2019 12:56:00 P
Matrix:	AQUEOUS	**Received Date:**	12/31/2019 12:57:23 PM

Analyses	Result	QL	Q	Units	DF	Date Prepared	Date Analyzed
VOLATILE ORGANIC COMPOUNDS		Analyst: **JAW**					**EPA 8260 B**
Methyl-tert-butyl ether	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Styrene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Tetrachloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Toluene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
trans-1,2-Dichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
trans-1,3-Dichloropropene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Trichloroethene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Trichlorofluoromethane	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Vinyl Chloride	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
m,p-Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:43 PM
o-Xylene	< 1.0	1.0		µg/L	1		12/31/19 4:43 PM
Total Xylene	< 2.0	2.0		µg/L	1		12/31/19 4:43 PM
Surr: 1,2-Dichloroethane-d4	128	70-130		%REC	1		12/31/19 4:43 PM
Surr: 4-Bromofluorobenzene	93.4	70-130		%REC	1		12/31/19 4:43 PM
Surr: Dibromofluoromethane	127	70-130		%REC	1		12/31/19 4:43 PM
Surr: Toluene-d8	96.7	70-130		%REC	1		12/31/19 4:43 PM

Form F-5079, 01.15
Geochemical Testing G1912F79

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Chain of Custody (COC) for State of Ohio

Shuttle/Cooler ID# P36

Landfill Site	GT Quote No.	Client Job No.	Date Results Required
Buckeye Brine		195-016	Std

REPORT RESULTS TO:

Name	Title	Mailing Address
Ray Stanley	SPM	250 W. Old Wilson Bridge Rd
Company: CEC	Dept.	City, State, Zip: Worthington, OH 43085
Telephone No.: 614 540 6633	E-mail Address: rstanley@cecinc.com	

Special Instructions:
See Table 1 for Analysis

ANALYSIS REQUESTED
Enter 'X' in box below to indicate request

CLIENT SAMPLE ID	DATE SAMPLED	TIME (24 hr)	COMP	GRAB	SAMPLE TYPE (MATRIX)	Number of Containers	Appendix I: Ammonia-N Preservative: 1:1 H_2SO_4	Appendix I: Total Metals Preservative: 1:1 HNO_3	Appendix I: Alkalinity Preservative: NONE	Appendix I: Chloride, NO_3+NO_2, Sulfate Preservative: NONE	Appendix I: TDS (Lab Filtered) Preservative: NONE	Appendix I: EDB/ DBCP Preservative: 1:1 HCl	Appendix I: VOC Preservative: 1:1 HCl	Appendix II: Semivolatiles (EPA 8270) Preservative: NONE	Appendix II: Pest/PCB/Hexachlorobenzene Preservative: NONE	Appendix II: Herbicides Preservative: NONE	Appendix II: Sulfide Preservative: NaOH / Zinc acetate	Appendix II: Cyanide Preservative: NaOH	Other Analysis:	Lab Use Only: Lab Number
~~MW-1~~ MW-3	12-27-19	1606		X	GW	7	X	X		X	X		X							001
MW-2	12-28-19	0852		X	↓	7	X	X		X	X		X							002
~~MW-3~~ MW-1	12-28-19	1035		X	↓	7	X	X		X	X		X							003
Trip Blank	–	–	–	–	WT	3	MS 12-31-19						X							004
Trip Blank 2	–	–	–	–	WT	3	MS 12-31-19													005

CHAIN OF CUSTODY			
Relinquished by:	Date/Time: 12-30-19	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received at lab by: Mulik Ghi	Date/Time: 12-31-19 1257
Method of Shipment:		Comments: SEQ1	Ice present on receipt: X Yes or ___ No
Authorized by: Mallory Bam (Client Signature MUST Accompany Request)	Date: 12-30-19		Cooler Temp (°C) on receipt: 3

Lab Use Only: SR 1st Review: MC; CS 2nd Review: 1

Please return completed form and samples to **Geochemical Testing • 2005 N Center Ave • Somerset, PA • 15501** • 814-443-1671 • (Fax: 814-445-6729)

Table 1

ANALYTICAL PROGRAM
Buckeye Brine Injection Facility
Keene Township
Coshocton County, Ohio

Analytical Program

Matrix	Analyte	Analytical Method [1]
Groundwater Sample	Ammonia	EPA 350.1
	Boron	EPA 6010B
	Calcium	EPA 6010B
	Chloride	SM4500 CIE
	Fluoride	SM4500 FC
	Iron	EPA 6010B
	Manganese	EPA 6010B
	pH	pH Meter / YSI Pro
	Potassium	EPA 6010B
	Specific Conductance	Conductivity Meter / YSI Pro
	Temperature	Temperature Probe / YSI Pro
	Total Dissolved Solids	SM2540C
	VOCs[2]	
	1,2,5-Trimethylbenzene	GCMS (EPA 8260B)
	1,3,5-Trimethylbenzene	GCMS (EPA 8260B)
	1,1,1-Trichloroethane (Methyl Chloroform)	GCMS (EPA 8260B)
	1,1,2,2-Tetrachloroethane	GCMS (EPA 8260B)
	1,1,2-Trichloro-1,2,2-trifluoroethane	GCMS (EPA 8260B)
	1,1,2-Trichloroethane	GCMS (EPA 8260B)
	1,1-Dichloroethane	GCMS (EPA 8260B)
	1,1-Dichloroethene (1,1-Dichloroethylene)	GCMS (EPA 8260B)
	1,2,4-Trichlorobenzene	GCMS (EPA 8260B)
	1,2-Dibromo-3-chloropropane	GCMS (EPA 8260B)
	1,2-Dibromoethane (Ethylene Dibromide)	GCMS (EPA 8260B)
	1,2-Dichlorobenzene	GCMS (EPA 8260B)
	1,2-Dichloroethane	GCMS (EPA 8260B)
	1,2-Dichloropropane	GCMS (EPA 8260B)
	1,3-Dichlorobenzene	GCMS (EPA 8260B)
	1,4-Dichlorobenzene (p-Dichlorobenzene)	GCMS (EPA 8260B)
	2-Butanone (Methyl Ethyl Ketone)	GCMS (EPA 8260B)
	2-Hexanone (Methyl n-Butyl Ketone)	GCMS (EPA 8260B)
	4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	GCMS (EPA 8260B)
	Acetone	GCMS (EPA 8260B)
	Benzene	GCMS (EPA 8260B)

Table 1

ANALYTICAL PROGRAM
Buckeye Brine Injection Facility
Keene Township
Coshocton County, Ohio

Analytical Program

Matrix	Analyte	Analytical Method [1]
Groundwater Sample	Bromodichloromethane	GCMS (EPA 8260B)
	Bromoform (Tribromomethane)	GCMS (EPA 8260B)
	Bromomethane (Methyl Bromide)	GCMS (EPA 8260B)
	Carbon disulfide	GCMS (EPA 8260B)
	Carbon tetrachloride	GCMS (EPA 8260B)
	Chlorobenzene	GCMS (EPA 8260B)
	Chloroethane (Ethyl Chloride)	GCMS (EPA 8260B)
	Chloroform	GCMS (EPA 8260B)
	Chloromethane (Methyl Chloride)	GCMS (EPA 8260B)
	cis-1,2-Dichloroethene	GCMS (EPA 8260B)
	cis-1,3-Dichloropropene	GCMS (EPA 8260B)
	Cyclohexane	GCMS (EPA 8260B)
	Dibromochloromethane (Chlorodibromomethane)	GCMS (EPA 8260B)
	Dichlorodifluoromethane (Freon 12)	GCMS (EPA 8260B)
	Ethylbenzene	GCMS (EPA 8260B)
	Isopropylbenzene (Cumene)	GCMS (EPA 8260B)
	Methyl acetate	GCMS (EPA 8260B)
	Methyl tert-butyl ether (MTBE)	GCMS (EPA 8260B)
	Methylcyclohexane	GCMS (EPA 8260B)
	Methylene chloride (Dichloromethane)	GCMS (EPA 8260B)
	Styrene	GCMS (EPA 8260B)
	Tetrachloroethene (PCE)	GCMS (EPA 8260B)
	Toluene	GCMS (EPA 8260B)
	trans-1,2-Dichloroethene (trans-1,2-Dichloroethylene)	GCMS (EPA 8260B)
	trans-1,3-Dichloropropene	GCMS (EPA 8260B)
	Trichloroethene (Trichloroethylene) (TCE)	GCMS (EPA 8260B)
	Trichlorofluoromethane (Fluorotrichloromethane) (Freon 11)	GCMS (EPA 8260B)
	Vinyl chloride	GCMS (EPA 8260B)
	Xylenes (total)	GCMS (EPA 8260B)

Notes:

[1] All analyses will be performed using U.S. EPA analytical methods from the following:

Third Edition (September 1986), as amended by updates I (July 1992), II (September 1994), IIA (August 1993), and IIB (January 1995), or the most current SW-846 update;

EPA's "Handbook for Analytical Quality Control in Water and Wastewater Laboratories" (EPA 600/1-79-019); and

Standard Methods for the Examination of Water and Wastewater.

[2] For Initial Round of Sampling Only

Geochemical Testing

Quality Assurance Project Report
Prepared for
CIVIL & ENVIRONMENTAL-COLUMBUS

1/21/2020

Signed: _____

Leslie Ann Nemeth
Project Manager

Signed: _____

David M. Glessner
Quality Assurance Coordinator

Geochemical Testing

Date: *21-Jan-20*

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Project: Buckeye Brine Injection Facility
Lab Order: G1912F78

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date	Date Received
G1912F78-001A	Field Dup		12/28/2019 12:00:01 AM	12/31/2019
G1912F78-001B	Field Dup		12/28/2019 12:00:01 AM	12/31/2019
G1912F78-001C	Field Dup		12/28/2019 12:00:01 AM	12/31/2019
G1912F78-001D	Field Dup		12/28/2019 12:00:01 AM	12/31/2019
G1912F78-001E	Field Dup		12/28/2019 12:00:01 AM	12/31/2019
G1912F78-002A	Rinsate Blank		12/28/2019 11:36:00 AM	12/31/2019
G1912F78-002B	Rinsate Blank		12/28/2019 11:36:00 AM	12/31/2019
G1912F78-002C	Rinsate Blank		12/28/2019 11:36:00 AM	12/31/2019
G1912F78-002D	Rinsate Blank		12/28/2019 11:36:00 AM	12/31/2019
G1912F78-002E	Rinsate Blank		12/28/2019 11:36:00 AM	12/31/2019
G1912F78-003A	Trip Blank		12/31/2019 12:56:00 PM	12/31/2019

Geochemical Testing

Date: *21-Jan-20*

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Project: Buckeye Brine Injection Facility
Lab Order: G1912F79

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date	Date Received
G1912F79-001A	MW-3		12/27/2019 4:06:00 PM	12/31/2019
G1912F79-001B	MW-3		12/27/2019 4:06:00 PM	12/31/2019
G1912F79-001C	MW-3		12/27/2019 4:06:00 PM	12/31/2019
G1912F79-001D	MW-3		12/27/2019 4:06:00 PM	12/31/2019
G1912F79-001E	MW-3		12/27/2019 4:06:00 PM	12/31/2019
G1912F79-002A	MW-2		12/28/2019 8:52:00 AM	12/31/2019
G1912F79-002B	MW-2		12/28/2019 8:52:00 AM	12/31/2019
G1912F79-002C	MW-2		12/28/2019 8:52:00 AM	12/31/2019
G1912F79-002D	MW-2		12/28/2019 8:52:00 AM	12/31/2019
G1912F79-002E	MW-2		12/28/2019 8:52:00 AM	12/31/2019
G1912F79-003A	MW-1		12/28/2019 10:35:00 AM	12/31/2019
G1912F79-003B	MW-1		12/28/2019 10:35:00 AM	12/31/2019
G1912F79-003C	MW-1		12/28/2019 10:35:00 AM	12/31/2019
G1912F79-003D	MW-1		12/28/2019 10:35:00 AM	12/31/2019
G1912F79-003E	MW-1		12/28/2019 10:35:00 AM	12/31/2019
G1912F79-004A	Trip Blank		12/31/2019 12:56:00 PM	12/31/2019
G1912F79-005A	Trip Blank 2		12/31/2019 12:56:00 PM	12/31/2019

Qualifier Exception Code

(1) Spike recovery limits are not applicable when the sample concentration exceeds the spike concentration by a factor of four or greater.

(2) When the LCS recovery is greater than the upper control limit, sample data is acceptable if it is less than the quantitation limit.

(3) Batch data is acceptable when the matrix spike exceeds control limits but the corresponding LCS is within control limits.

(4) Laboratory duplicate. If one or both of the values is less than 5 times the PQL, the allowed difference is +/- the PQL.

Geochemical Testing

PREP BATCH REPORT

Prep Start Date: **1/2/2020 8:05:00 AM**
Prep End Date: **1/2/2020 1:35:00 PM**

Prep Batch **171935** Prep Code: **MEPR6010_3010** Technician: **Kristy L Botteicher**

Prep Factor Units: **mL / mL**

Sample ID	ClientSampID	Matrix	CollectionDate	SampAmt	Fin Vol	PQual	factor	PrepStart	PrepEnd
G1912F78-001D	Field Dup	Groundwater	12/28/2019 12:00:01 AM	50	50		1.000	1/2/2020	1/2/2020
G1912F78-001DDUP		Aqueous	1/2/2020	50	50		1.000	1/2/2020	1/2/2020
G1912F78-001DMS		Aqueous	1/2/2020	50	50		1.000	1/2/2020	1/2/2020
G1912F78-002D	Rinsate Blank	Groundwater	12/28/2019 11:36:00 AM	50	50		1.000	1/2/2020	1/2/2020
G1912F79-001D	MW-3	Groundwater	12/27/2019 4:06:00 PM	50	50		1.000	1/2/2020	1/2/2020
G1912F79-002D	MW-2	Groundwater	12/28/2019 8:52:00 AM	50	50		1.000	1/2/2020	1/2/2020
G1912F79-003D	MW-1	Groundwater	12/28/2019 10:35:00 AM	50	50		1.000	1/2/2020	1/2/2020
LCS1-171935		Aqueous	1/2/2020	50	50		1.000	1/2/2020	1/2/2020
PB-171935		Aqueous	1/2/2020	50	50		1.000	1/2/2020	1/2/2020

Geochemical Testing

PREP BATCH REPORT

Prep Start Date: **12/31/2019 4:05:00 PM**
Prep End Date: **12/31/2019 4:05:00 PM**

Prep Batch **171917** Prep Code: **INPR_IC** Technician: **Michael B. Galish**

Prep Factor Units: **mL / mL**

Sample ID	ClientSampID	Matrix	CollectionDate	SampAmt	Fin Vol	PQual	factor	PrepStart	PrepEnd
G1912F53-001B	Outfall 001	Groundwater	12/30/2019 9:25:00 AM	100	100		1.000	12/31/2019	12/31/2019
G1912F53-001BDUP		Aqueous	12/31/2019	100	100		1.000	12/31/2019	12/31/2019
G1912F53-001BLFM		Aqueous	12/31/2019	100	100		1.000	12/31/2019	12/31/2019
G1912F57-001E	Cooling Tower #1	Waste Water	12/30/2019 2:50:00 PM	100	100		1.000	12/31/2019	12/31/2019
G1912F78-001B	Field Dup	Groundwater	12/28/2019 12:00:01 AM	100	100		1.000	12/31/2019	12/31/2019
G1912F78-002B	Rinsate Blank	Groundwater	12/28/2019 11:36:00 AM	100	100		1.000	12/31/2019	12/31/2019
G1912F79-001B	MW-3	Groundwater	12/27/2019 4:06:00 PM	100	100		1.000	12/31/2019	12/31/2019
G1912F79-001BDUP		Aqueous	12/31/2019	100	100		1.000	12/31/2019	12/31/2019
G1912F79-001BLFM		Aqueous	12/31/2019	100	100		1.000	12/31/2019	12/31/2019
G1912F79-002B	MW-2	Groundwater	12/28/2019 8:52:00 AM	100	100		1.000	12/31/2019	12/31/2019
G1912F79-003B	MW-1	Groundwater	12/28/2019 10:35:00 AM	100	100		1.000	12/31/2019	12/31/2019
G1912F82-001C	JWT 613 Comp	Waste Water	12/31/2019 6:15:00 AM	100	100		1.000	12/31/2019	12/31/2019
G1912F83-001C	Outfall 101	Aqueous	12/31/2019 12:15:00 PM	100	100		1.000	12/31/2019	12/31/2019

Geochemical Testing

PREP BATCH REPORT

Prep Start Date: **12/31/2019 3:10:00 PM**
Prep End Date: **12/31/2019 3:15:00 PM**

Prep Batch **171920** Prep Code: **WATERPR_TDS** Technician: **Glenn M. Giles**

Prep Factor Units: **mL / mL**

Sample ID	ClientSampID	Matrix	CollectionDate	SampAmt	Fin Vol	PQual	factor	PrepStart	PrepEnd
Blank-171920			12/31/2019	50	50		1.000	12/31/2019	12/31/2019
G1912E84-001C	Outfall 001		12/31/2019	50	50		1.000	12/31/2019	12/31/2019
G1912E84-001CDUP			12/31/2019	50	50		1.000	12/31/2019	12/31/2019
G1912F24-001F	Pretreated Leachate-D	Waste Water	12/28/2019 11:55:00 AM	10	50		5.000	12/31/2019	12/31/2019
G1912F24-001FDUP			12/31/2019	10	50		5.000	12/31/2019	12/31/2019
G1912F25-001A	Outfall 601	Waste Water	12/27/2019 11:30:00 AM	50	50		1.000	12/31/2019	12/31/2019
G1912F53-001A	Outfall 001	Groundwater	12/30/2019 9:25:00 AM	50	50		1.000	12/31/2019	12/31/2019
G1912F57-001A	Cooling Tower #1	Waste Water	12/30/2019 2:50:00 PM	50	50		1.000	12/31/2019	12/31/2019
G1912F78-001C	Field Dup	Groundwater	12/28/2019 12:00:01 AM	10	50		5.000	12/31/2019	12/31/2019
G1912F78-002C	Rinsate Blank	Groundwater	12/28/2019 11:36:00 AM	50	50		1.000	12/31/2019	12/31/2019
G1912F79-001C	MW-3	Groundwater	12/27/2019 4:06:00 PM	10	50		5.000	12/31/2019	12/31/2019
G1912F79-002C	MW-2	Groundwater	12/28/2019 8:52:00 AM	10	50		5.000	12/31/2019	12/31/2019
G1912F79-003C	MW-1	Groundwater	12/28/2019 10:35:00 AM	10	50		5.000	12/31/2019	12/31/2019
LCS-171920			12/31/2019	50	50		1.000	12/31/2019	12/31/2019

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: COND_EPA 120.1

Sample ID: COND LL	SampType: COND LL	TestCode: COND_EPA 1	Units: µmhos/cm	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: EPA 120.1		Analysis Date: 1/2/2020	SeqNo: 5677776

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	151.0	5.00	146.9	0	103	90	110				

Sample ID: COND LL	SampType: COND LL	TestCode: COND_EPA 1	Units: µmhos/cm	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: EPA 120.1		Analysis Date: 1/2/2020	SeqNo: 5677802

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	151.0	5.00	146.9	0	103	90	110				

Sample ID: COND LL	SampType: COND LL	TestCode: COND_EPA 1	Units: µmhos/cm	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: EPA 120.1		Analysis Date: 1/2/2020	SeqNo: 5677844

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	151.0	5.00	146.9	0	103	90	110				

Sample ID: COND LCS	SampType: LCS	TestCode: COND_EPA 1	Units: µmhos/cm	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: EPA 120.1		Analysis Date: 1/2/2020	SeqNo: 5677775

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	1412	5.00	1409	0	100	90	110				

Sample ID: COND LCS	SampType: LCS	TestCode: COND_EPA 1	Units: µmhos/cm	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: EPA 120.1		Analysis Date: 1/2/2020	SeqNo: 5677801

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	1408	5.00	1409	0	99.9	90	110				

Sample ID: COND LCS	SampType: LCS	TestCode: COND_EPA 1	Units: µmhos/cm	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: EPA 120.1		Analysis Date: 1/2/2020	SeqNo: 5677843

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	1429	5.00	1409	0	101	90	110				

ANALYTICAL QC SUMMARY REPORT

TestCode: COND_EPA 120.1

Sample ID: **G1912F69-002ADUP**	SampType: **DUP**	TestCode: **COND_EPA 1**	Units: **µmhos/cm**	Prep Date:	RunNo: **226495**
Client ID:	Batch ID: **R226495**	TestNo: **EPA 120.1**		Analysis Date: **1/2/2020**	SeqNo: **5677780**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	645.0	5.00						647	0.310	20	

Sample ID: **G2001022-001ADUP**	SampType: **DUP**	TestCode: **COND_EPA 1**	Units: **µmhos/cm**	Prep Date:	RunNo: **226495**
Client ID:	Batch ID: **R226495**	TestNo: **EPA 120.1**		Analysis Date: **1/2/2020**	SeqNo: **5677816**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductance	260.0	5.00						260	0	20	

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **BLANK** SampType: **MBLK** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226442**
Client ID: Batch ID: **R226442** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5676809**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	< 1.00	1.00									
1,1,1-Trichloroethane	< 1.00	1.00									
1,1,2,2-Tetrachloroethane	< 1.00	1.00									
1,1,2-Trichloroethane	< 1.00	1.00									
1,1-Dichloroethane	< 1.00	1.00									
1,1-Dichloroethene	< 1.00	1.00									
1,1-Dichloropropene	< 1.00	1.00									
1,2,3-Trichlorobenzene	< 5.00	5.00									
1,2,3-Trichloropropane	< 1.00	1.00									
1,2,4-Trichlorobenzene	< 1.00	1.00									
1,2,4-Trimethylbenzene	< 1.00	1.00									
1,2-Dibromo-3-chloropropane	< 5.00	5.00									
1,2-Dibromoethane	< 1.00	1.00									
1,2-Dichlorobenzene	< 1.00	1.00									
1,2-Dichloroethane	< 1.00	1.00									
1,2-Dichloropropane	< 1.00	1.00									
1,3,5-Trimethylbenzene	< 1.00	1.00									
1,3-Dichlorobenzene	< 1.00	1.00									
1,3-Dichloropropane	< 1.00	1.00									
1,4-Dichlorobenzene	< 1.00	1.00									
1,4-Dioxane	< 50.0	50.0									
1-Propanol	< 100	100									
2,2-Dichloropropane	< 1.00	1.00									
2-Butanone	< 5.00	5.00									
2-chloro-1,3-butadiene	< 1.00	1.00									
2-Chlorotoluene	< 1.00	1.00									
2-Hexanone	< 5.00	5.00									
2-Methyl-1-propanol	< 50.0	50.0									
2-Methylnaphthalene	< 20.0	20.0									
2-Nitropropane	< 1.00	1.00									
2-Propanol	< 100	100									
3-Chloro-1-Propene	< 1.00	1.00									
4-Chlorotoluene	< 1.00	1.00									
4-Isopropyltoluene	< 1.00	1.00									
4-Methyl-2-Pentanone	< 1.00	1.00									
Acetone	< 10.0	10.0									

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **BLANK** SampType: **MBLK** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226442**
Client ID: Batch ID: **R226442** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5676809**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Acetonitrile	< 20.0	20.0									
Allyl chloride	< 1.00	1.00									
Benzene	< 1.00	1.00									
Benzyl chloride	< 5.00	5.00									
Bromobenzene	< 1.00	1.00									
Bromochloromethane	< 1.00	1.00									
Bromodichloromethane	< 1.00	1.00									
Bromoform	< 1.00	1.00									
Bromomethane	< 1.00	1.00									
Carbon Disulfide	< 1.00	1.00									
Carbon Tetrachloride	< 1.00	1.00									
Chlorobenzene	< 1.00	1.00									
Chlorodibromomethane	< 1.00	1.00									
Chloroethane	< 1.00	1.00									
Chloroform	< 1.00	1.00									
Chloromethane	< 1.00	1.00									
Chloroprene	< 1.00	1.00									
cis-1,2-Dichloroethene	< 1.00	1.00									
cis-1,3-Dichloropropene	< 1.00	1.00									
Cyclohexane	< 5.00	5.00									
Dibromomethane	< 1.00	1.00									
Dichlorobromomethane	< 1.00	1.00									
Dichlorodifluoromethane	< 1.00	1.00									
Dichlorofluoromethane	< 1.00	1.00									
Diethyl Ether	< 5.00	5.00									
Diisopropyl ether	< 1.00	1.00									
Ethyl acetate	< 5.00	5.00									
Ethyl Methacrylate	< 1.00	1.00									
Ethylbenzene	< 1.00	1.00									
Hexachlorobutadiene	< 5.00	5.00									
Hexachloroethane	< 5.00	5.00									
Iodomethane	< 5.00	5.00									
Isobutyl alcohol	< 50.0	50.0									
Isopropylbenzene	< 1.00	1.00									
m,p-Xylene	< 2.00	2.00									
Methacrylonitrile	< 10.0	10.0									

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **BLANK** SampType: **MBLK** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226442**
Client ID: Batch ID: **R226442** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5676809**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl Ethyl Ketone	< 5.00	5.00									
Methyl methacrylate	< 1.00	1.00									
Methylcyclohexane	< 1.00	1.00									
Methylene Chloride	< 1.00	1.00									
Methyl-tert-butyl ether	< 1.00	1.00									
Naphthalene	< 5.00	5.00									
n-Butanol	< 20.0	20.0									
n-Butylbenzene	< 1.00	1.00									
n-Propylbenzene	< 1.00	1.00									
o-Xylene	< 1.00	1.00									
Pentachloroethane	< 2.00	2.00									
p-Isopropyltoluene	< 1.00	1.00									
Propionitrile	< 10.0	10.0									
sec-Butylbenzene	< 1.00	1.00									
Styrene	< 1.00	1.00									
tert-Butylbenzene	< 1.00	1.00									
Tetrachloroethene	< 1.00	1.00									
Tetrahydrofuran	< 5.00	5.00									
Toluene	< 1.00	1.00									
Total Xylene	< 2.00	2.00									
trans-1,2-Dichloroethene	< 1.00	1.00									
trans-1,3-Dichloropropene	< 1.00	1.00									
trans-1,4-Dichloro-2-butene	< 2.00	2.00									
Tribromomethane	< 1.00	1.00									
Trichloroethene	< 1.00	1.00									
Trichlorofluoromethane	< 1.00	1.00									
Trichloromethane	< 1.00	1.00									
Vinyl Acetate	< 1.00	1.00									
Vinyl Chloride	< 1.00	1.00									
Surr: 1,2-Dichloroethane-d4	34.68	0	30	0	116	70	130				
Surr: 4-Bromofluorobenzene	27.79	0	30	0	92.6	70	130				
Surr: Dibromofluoromethane	34.63	0	30	0	115	70	130				
Surr: Toluene-d8	28.58	0	30	0	95.3	70	130				

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: BLANK	SampType: MBLK	TestCode: EPA8260_VO	Units: µg/L	Prep Date:	RunNo: 226457
Client ID:	Batch ID: R226457	TestNo: EPA 8260 B		Analysis Date: 12/31/2019	SeqNo: 5677157

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	< 1.00	1.00									
1,1,1-Trichloroethane	< 1.00	1.00									
1,1,2,2-Tetrachloroethane	< 1.00	1.00									
1,1,2-Trichloroethane	< 1.00	1.00									
1,1-Dichloroethane	< 1.00	1.00									
1,1-Dichloroethene	< 1.00	1.00									
1,1-Dichloropropene	< 1.00	1.00									
1,2,3-Trichlorobenzene	< 5.00	5.00									
1,2,3-Trichloropropane	< 1.00	1.00									
1,2,4-Trichlorobenzene	< 1.00	1.00									
1,2,4-Trimethylbenzene	< 1.00	1.00									
1,2-Dibromo-3-chloropropane	< 5.00	5.00									
1,2-Dibromoethane	< 1.00	1.00									
1,2-Dichlorobenzene	< 1.00	1.00									
1,2-Dichloroethane	< 1.00	1.00									
1,2-Dichloropropane	< 1.00	1.00									
1,3,5-Trimethylbenzene	< 1.00	1.00									
1,3-Dichlorobenzene	< 1.00	1.00									
1,3-Dichloropropane	< 1.00	1.00									
1,4-Dichlorobenzene	< 1.00	1.00									
1,4-Dioxane	< 50.0	50.0									
1-Propanol	< 100	100									
2,2-Dichloropropane	< 1.00	1.00									
2-Butanone	< 5.00	5.00									
2-chloro-1,3-butadiene	< 1.00	1.00									
2-Chlorotoluene	< 1.00	1.00									
2-Hexanone	< 5.00	5.00									
2-Methyl-1-propanol	< 50.0	50.0									
2-Methylnaphthalene	< 20.0	20.0									
2-Nitropropane	< 1.00	1.00									
2-Propanol	< 100	100									
3-Chloro-1-Propene	< 1.00	1.00									
4-Chlorotoluene	< 1.00	1.00									
4-Isopropyltoluene	< 1.00	1.00									
4-Methyl-2-Pentanone	< 1.00	1.00									
Acetone	< 10.0	10.0									

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **BLANK**	SampType: **MBLK**	TestCode: **EPA8260_VO**	Units: **µg/L**	Prep Date:	RunNo: **226457**
Client ID:	Batch ID: **R226457**	TestNo: **EPA 8260 B**		Analysis Date: **12/31/2019**	SeqNo: **5677157**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Acetonitrile	< 20.0	20.0									
Allyl chloride	< 1.00	1.00									
Benzene	< 1.00	1.00									
Benzyl chloride	< 5.00	5.00									
Bromobenzene	< 1.00	1.00									
Bromochloromethane	< 1.00	1.00									
Bromodichloromethane	< 1.00	1.00									
Bromoform	< 1.00	1.00									
Bromomethane	< 1.00	1.00									
Carbon Disulfide	< 1.00	1.00									
Carbon Tetrachloride	< 1.00	1.00									
Chlorobenzene	< 1.00	1.00									
Chlorodibromomethane	< 1.00	1.00									
Chloroethane	< 1.00	1.00									
Chloroform	< 1.00	1.00									
Chloromethane	< 1.00	1.00									
Chloroprene	< 1.00	1.00									
cis-1,2-Dichloroethene	< 1.00	1.00									
cis-1,3-Dichloropropene	< 1.00	1.00									
Cyclohexane	< 5.00	5.00									
Dibromomethane	< 1.00	1.00									
Dichlorobromomethane	< 1.00	1.00									
Dichlorodifluoromethane	< 1.00	1.00									
Dichlorofluoromethane	< 1.00	1.00									
Diethyl Ether	< 5.00	5.00									
Diisopropyl ether	< 1.00	1.00									
Ethyl acetate	< 5.00	5.00									
Ethyl Methacrylate	< 1.00	1.00									
Ethylbenzene	< 1.00	1.00									
Hexachlorobutadiene	< 5.00	5.00									
Hexachloroethane	< 5.00	5.00									
Iodomethane	< 5.00	5.00									
Isobutyl alcohol	< 50.0	50.0									
Isopropylbenzene	< 1.00	1.00									
m,p-Xylene	< 2.00	2.00									
Methacrylonitrile	< 10.0	10.0									

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **BLANK** SampType: **MBLK** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677157**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl Ethyl Ketone	< 5.00	5.00									
Methyl methacrylate	< 1.00	1.00									
Methylcyclohexane	< 1.00	1.00									
Methylene Chloride	< 1.00	1.00									
Methyl-tert-butyl ether	< 1.00	1.00									
Naphthalene	< 5.00	5.00									
n-Butanol	< 20.0	20.0									
n-Butylbenzene	< 1.00	1.00									
n-Propylbenzene	< 1.00	1.00									
o-Xylene	< 1.00	1.00									
Pentachloroethane	< 2.00	2.00									
p-Isopropyltoluene	< 1.00	1.00									
Propionitrile	< 10.0	10.0									
sec-Butylbenzene	< 1.00	1.00									
Styrene	< 1.00	1.00									
tert-Butylbenzene	< 1.00	1.00									
Tetrachloroethene	< 1.00	1.00									
Tetrahydrofuran	< 5.00	5.00									
Toluene	< 1.00	1.00									
Total Xylene	< 2.00	2.00									
trans-1,2-Dichloroethene	< 1.00	1.00									
trans-1,3-Dichloropropene	< 1.00	1.00									
trans-1,4-Dichloro-2-butene	< 2.00	2.00									
Tribromomethane	< 1.00	1.00									
Trichloroethene	< 1.00	1.00									
Trichlorofluoromethane	< 1.00	1.00									
Trichloromethane	< 1.00	1.00									
Vinyl Acetate	< 1.00	1.00									
Vinyl Chloride	< 1.00	1.00									
Surr: 1,2-Dichloroethane-d4	30.12	0	30	0	100	70	130				
Surr: 4-Bromofluorobenzene	28.82	0	30	0	96.1	70	130				
Surr: Dibromofluoromethane	30.40	0	30	0	101	70	130				
Surr: Toluene-d8	30.13	0	30	0	100	70	130				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **20 PPB LCS** SampType: **LCS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226442**
Client ID: Batch ID: **R226442** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5676808**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	22.19	1.00	20	0	111	81	125				
1,1,1-Trichloroethane	23.95	1.00	20	0	120	71	125				
1,1,2,2-Tetrachloroethane	19.15	1.00	20	0	95.8	80	116				
1,1,2-Trichloroethane	22.26	1.00	20	0	111	83	126				
1,1-Dichloroethane	22.66	1.00	20	0	113	73	122				
1,1-Dichloroethene	22.59	1.00	20	0	113	74	121				
1,1-Dichloropropene	22.10	1.00	20	0	110	74	120				
1,2,3-Trichlorobenzene	18.98	5.00	20	0	94.9	61	136				
1,2,3-Trichloropropane	19.53	1.00	20	0	97.6	77	118				
1,2,4-Trichlorobenzene	20.58	1.00	20	0	103	68	126				
1,2,4-Trimethylbenzene	18.77	1.00	20	0	93.8	78	128				
1,2-Dibromo-3-chloropropane	21.67	5.00	20	0	108	64	126				
1,2-Dibromoethane	22.73	1.00	20	0	114	83	119				
1,2-Dichlorobenzene	18.34	1.00	20	0	91.7	85	119				
1,2-Dichloroethane	23.76	1.00	20	0	119	72	123				
1,2-Dichloropropane	21.28	1.00	20	0	106	83	122				
1,3,5-Trimethylbenzene	18.84	1.00	20	0	94.2	85	119				
1,3-Dichlorobenzene	19.25	1.00	20	0	96.2	82	119				
1,3-Dichloropropane	21.32	1.00	20	0	107	80	118				
1,4-Dichlorobenzene	19.05	1.00	20	0	95.2	83	120				
1,4-Dioxane	236.3	50.0	200	0	118	39	186				
1-Propanol	304.7	100	200	0	152	36	170				
2,2-Dichloropropane	24.43	1.00	20	0	122	32	157				
2-Butanone	23.41	5.00	20	0	117	61	125				
2-chloro-1,3-butadiene	24.05	1.00	20	0	120	70	124				
2-Chlorotoluene	18.62	1.00	20	0	93.1	82	123				
2-Hexanone	22.72	5.00	20	0	114	58	132				
2-Methyl-1-propanol	232.6	50.0	200	0	116	29	163				
2-Methylnaphthalene	< 20.0	20.0	20	0	81.8	41	143				
2-Nitropropane	25.79	1.00	20	0	129	60	138				
2-Propanol	241.4	100	200	0	121	43	161				
3-Chloro-1-Propene	23.24	1.00	20	0	116	65	127				
4-Chlorotoluene	18.98	1.00	20	0	94.9	80	121				
4-Isopropyltoluene	18.91	1.00	20	0	94.5	83	117				
4-Methyl-2-Pentanone	22.76	1.00	20	0	114	68	127				
Acetone	22.75	10.0	20	0	114	60	133				

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **20 PPB LCS** SampType: **LCS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226442**
Client ID: Batch ID: **R226442** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5676808**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Acetonitrile	274.7	20.0	200	0	137	61	132				S
Allyl chloride	23.24	1.00	20	0	116	65	127				
Benzene	21.86	1.00	20	0	109	76	122				
Benzyl chloride	19.92	5.00	20	0	99.6	20	154				
Bromobenzene	18.64	1.00	20	0	93.2	78	120				
Bromochloromethane	23.69	1.00	20	0	118	78	124				
Bromodichloromethane	23.76	1.00	20	0	119	71	138				
Bromoform	20.60	1.00	20	0	103	71	125				
Bromomethane	23.13	1.00	20	0	116	47	152				
Carbon Disulfide	23.40	1.00	20	0	117	63	123				
Carbon Tetrachloride	25.26	1.00	20	0	126	68	133				
Chlorobenzene	20.03	1.00	20	0	100	83	118				
Chlorodibromomethane	25.06	1.00	20	0	125	74	131				
Chloroethane	21.42	1.00	20	0	107	56	127				
Chloroform	22.94	1.00	20	0	115	73	123				
Chloromethane	23.87	1.00	20	0	119	65	129				
Chloroprene	24.05	1.00	20	0	120	70	124				
cis-1,2-Dichloroethene	22.49	1.00	20	0	112	75	121				
cis-1,3-Dichloropropene	23.10	1.00	20	0	115	71	129				
Cyclohexane	21.45	5.00	20	0	107	72	119				
Dibromomethane	22.68	1.00	20	0	113	83	118				
Dichlorobromomethane	23.76	1.00	20	0	119	56	145				
Dichlorodifluoromethane	24.69	1.00	20	0	123	60	138				
Dichlorofluoromethane	24.78	1.00	20	0	124	74	123				S
Diethyl Ether	22.15	5.00	20	0	111	54	142				
Diisopropyl ether	22.76	1.00	20	0	114	72	132				
Ethyl acetate	23.08	5.00	20	0	115	77	123				
Ethyl Methacrylate	22.25	1.00	20	0	111	72	126				
Ethylbenzene	20.04	1.00	20	0	100	84	120				
Hexachlorobutadiene	21.28	5.00	20	0	106	70	118				
Hexachloroethane	22.52	5.00	20	0	113	59	130				
Iodomethane	27.11	5.00	20	0	136	29	162				
Isobutyl alcohol	232.6	50.0	200	0	116	29	163				
Isopropylbenzene	20.04	1.00	20	0	100	83	124				
m,p-Xylene	40.28	2.00	40	0	101	86	117				
Methacrylonitrile	233.0	10.0	200	0	117	69	126				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **20 PPB LCS** SampType: **LCS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226442**
Client ID: Batch ID: **R226442** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5676808**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl Ethyl Ketone	23.41	5.00	20	0	117	72	131				
Methyl methacrylate	21.50	1.00	20	0	108	74	122				
Methylcyclohexane	22.25	1.00	20	0	111	76	116				
Methylene Chloride	22.09	1.00	20	0	110	73	133				
Methyl-tert-butyl ether	22.44	1.00	20	0	112	75	125				
Naphthalene	19.25	5.00	20	0	96.2	59	134				
n-Butanol	229.2	20.0	200	0	115	56	152				
n-Butylbenzene	19.03	1.00	20	0	95.2	79	116				
n-Propylbenzene	18.75	1.00	20	0	93.8	82	119				
o-Xylene	20.02	1.00	20	0	100	86	117				
Pentachloroethane	21.88	2.00	20	0	109	73	123				
p-Isopropyltoluene	18.91	1.00	20	0	94.5	83	117				
Propionitrile	235.4	10.0	200	0	118	63	129				
sec-Butylbenzene	19.38	1.00	20	0	96.9	82	119				
Styrene	20.70	1.00	20	0	103	88	116				
tert-Butylbenzene	19.20	1.00	20	0	96.0	79	127				
Tetrachloroethene	22.18	1.00	20	0	111	76	127				
Tetrahydrofuran	22.82	5.00	20	0	114	62	129				
Toluene	21.02	1.00	20	0	105	80	118				
Total Xylene	60.30	2.00	60	0	100	87	116				
trans-1,2-Dichloroethene	22.40	1.00	20	0	112	73	120				
trans-1,3-Dichloropropene	23.29	1.00	20	0	116	70	126				
trans-1,4-Dichloro-2-butene	19.02	2.00	20	0	95.1	46	137				
Tribromomethane	20.60	1.00	20	0	103	71	125				
Trichloroethene	21.28	1.00	20	0	106	73	123				
Trichlorofluoromethane	23.98	1.00	20	0	120	69	125				
Trichloromethane	22.94	1.00	20	0	115	73	123				
Vinyl Acetate	23.39	1.00	20	0	117	67	131				
Vinyl Chloride	25.07	1.00	20	0	125	56	125				S
Surr: 1,2-Dichloroethane-d4	32.46	0	30	0	108	70	130				
Surr: 4-Bromofluorobenzene	28.91	0	30	0	96.4	70	130				
Surr: Dibromofluoromethane	34.06	0	30	0	114	70	130				
Surr: Toluene-d8	28.44	0	30	0	94.8	70	130				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **20 PPB LCS** SampType: **LCS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677156**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	20.69	1.00	20	0	103	81	125				
1,1,1-Trichloroethane	21.61	1.00	20	0	108	71	125				
1,1,2,2-Tetrachloroethane	17.63	1.00	20	0	88.1	80	116				
1,1,2-Trichloroethane	18.09	1.00	20	0	90.4	83	126				
1,1-Dichloroethane	21.72	1.00	20	0	109	73	122				
1,1-Dichloroethene	21.65	1.00	20	0	108	74	121				
1,1-Dichloropropene	21.08	1.00	20	0	105	74	120				
1,2,3-Trichlorobenzene	17.30	5.00	20	0	86.5	61	136				
1,2,3-Trichloropropane	16.39	1.00	20	0	82.0	77	118				
1,2,4-Trichlorobenzene	18.24	1.00	20	0	91.2	68	126				
1,2,4-Trimethylbenzene	19.00	1.00	20	0	95.0	78	128				
1,2-Dibromo-3-chloropropane	14.67	5.00	20	0	73.4	64	126				
1,2-Dibromoethane	17.76	1.00	20	0	88.8	83	119				
1,2-Dichlorobenzene	18.98	1.00	20	0	94.9	85	119				
1,2-Dichloroethane	20.38	1.00	20	0	102	72	123				
1,2-Dichloropropane	20.09	1.00	20	0	100	83	122				
1,3,5-Trimethylbenzene	19.44	1.00	20	0	97.2	85	119				
1,3-Dichlorobenzene	18.84	1.00	20	0	94.2	82	119				
1,3-Dichloropropane	18.06	1.00	20	0	90.3	80	118				
1,4-Dichlorobenzene	18.62	1.00	20	0	93.1	83	120				
1,4-Dioxane	149.1	50.0	200	0	74.5	39	186				
1-Propanol	187.0	100	200	0	93.5	36	170				
2,2-Dichloropropane	19.25	1.00	20	0	96.3	32	157				
2-Butanone	14.78	5.00	20	0	73.9	61	125				
2-chloro-1,3-butadiene	21.98	1.00	20	0	110	70	124				
2-Chlorotoluene	18.80	1.00	20	0	94.0	82	123				
2-Hexanone	13.95	5.00	20	0	69.7	58	132				
2-Methyl-1-propanol	128.8	50.0	200	0	64.4	29	163				
2-Nitropropane	14.42	1.00	20	0	72.1	60	138				
2-Propanol	139.0	100	200	0	69.5	43	161				
3-Chloro-1-Propene	21.47	1.00	20	0	107	65	127				
4-Chlorotoluene	19.82	1.00	20	0	99.1	80	121				
4-Isopropyltoluene	19.10	1.00	20	0	95.5	83	117				
4-Methyl-2-Pentanone	15.00	1.00	20	0	75.0	68	127				
Acetone	15.49	10.0	20	0	77.5	60	133				
Acetonitrile	212.9	20.0	200	0	106	61	132				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **20 PPB LCS** SampType: **LCS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677156**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Allyl chloride	21.47	1.00	20	0	107	65	127				
Benzene	20.88	1.00	20	0	104	76	122				
Benzyl chloride	11.25	5.00	20	0	56.3	20	154				
Bromobenzene	19.00	1.00	20	0	95.0	78	120				
Bromochloromethane	21.14	1.00	20	0	106	78	124				
Bromodichloromethane	20.49	1.00	20	0	102	71	138				
Bromoform	17.03	1.00	20	0	85.1	71	125				
Bromomethane	22.50	1.00	20	0	112	47	152				
Carbon Disulfide	20.85	1.00	20	0	104	63	123				
Carbon Tetrachloride	22.34	1.00	20	0	112	68	133				
Chlorobenzene	19.36	1.00	20	0	96.8	83	118				
Chlorodibromomethane	18.15	1.00	20	0	90.8	74	131				
Chloroethane	23.15	1.00	20	0	116	56	127				
Chloroform	21.06	1.00	20	0	105	73	123				
Chloromethane	17.90	1.00	20	0	89.5	65	129				
Chloroprene	21.98	1.00	20	0	110	70	124				
cis-1,2-Dichloroethene	21.05	1.00	20	0	105	75	121				
cis-1,3-Dichloropropene	19.16	1.00	20	0	95.8	71	129				
Cyclohexane	20.96	5.00	20	0	105	72	119				
Dibromomethane	18.81	1.00	20	0	94.0	83	118				
Dichlorobromomethane	20.49	1.00	20	0	102	56	145				
Dichlorodifluoromethane	19.83	1.00	20	0	99.2	60	138				
Dichlorofluoromethane	20.32	1.00	20	0	102	74	123				
Diethyl Ether	21.18	5.00	20	0	106	54	142				
Diisopropyl ether	22.00	1.00	20	0	110	72	132				
Ethyl acetate	16.73	5.00	20	0	83.7	77	123				
Ethyl Methacrylate	16.65	1.00	20	0	83.2	72	126				
Ethylbenzene	19.64	1.00	20	0	98.2	84	120				
Hexachlorobutadiene	18.74	5.00	20	0	93.7	70	118				
Hexachloroethane	19.69	5.00	20	0	98.4	59	130				
Iodomethane	23.99	5.00	20	0	120	29	162				
Isobutyl alcohol	128.8	50.0	200	0	64.4	29	163				
Isopropylbenzene	19.23	1.00	20	0	96.2	83	124				
m,p-Xylene	38.82	2.00	40	0	97.1	86	117				
Methacrylonitrile	171.1	10.0	200	0	85.6	69	126				
Methyl Ethyl Ketone	14.78	5.00	20	0	73.9	72	131				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **20 PPB LCS** SampType: **LCS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677156**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl methacrylate	16.53	1.00	20	0	82.7	74	122				
Methylcyclohexane	19.69	1.00	20	0	98.4	76	116				
Methylene Chloride	21.83	1.00	20	0	109	73	133				
Methyl-tert-butyl ether	20.78	1.00	20	0	104	75	125				
Naphthalene	15.29	5.00	20	0	76.4	59	134				
n-Butanol	126.0	20.0	200	0	63.0	56	152				
n-Butylbenzene	18.71	1.00	20	0	93.6	79	116				
n-Propylbenzene	19.01	1.00	20	0	95.0	82	119				
o-Xylene	19.04	1.00	20	0	95.2	86	117				
Pentachloroethane	18.88	2.00	20	0	94.4	73	123				
p-Isopropyltoluene	19.10	1.00	20	0	95.5	83	117				
Propionitrile	151.2	10.0	200	0	75.6	63	129				
sec-Butylbenzene	19.25	1.00	20	0	96.2	82	119				
Styrene	19.16	1.00	20	0	95.8	88	116				
tert-Butylbenzene	19.56	1.00	20	0	97.8	79	127				
Tetrachloroethene	19.07	1.00	20	0	95.3	76	127				
Tetrahydrofuran	14.56	5.00	20	0	72.8	62	129				
Toluene	19.63	1.00	20	0	98.1	80	118				
Total Xylene	57.87	2.00	60	0	96.4	87	116				
trans-1,2-Dichloroethene	21.95	1.00	20	0	110	73	120				
trans-1,3-Dichloropropene	18.04	1.00	20	0	90.2	70	126				
trans-1,4-Dichloro-2-butene	15.23	2.00	20	0	76.2	46	137				
Tribromomethane	17.03	1.00	20	0	85.1	71	125				
Trichloroethene	20.27	1.00	20	0	101	73	123				
Trichlorofluoromethane	22.54	1.00	20	0	113	69	125				
Trichloromethane	21.06	1.00	20	0	105	73	123				
Vinyl Acetate	20.90	1.00	20	0	104	67	131				
Vinyl Chloride	20.67	1.00	20	0	103	56	125				
Surr: 1,2-Dichloroethane-d4	29.30	0	30	0	97.7	70	130				
Surr: 4-Bromofluorobenzene	29.72	0	30	0	99.1	70	130				
Surr: Dibromofluoromethane	32.26	0	30	0	108	70	130				
Surr: Toluene-d8	31.09	0	30	0	104	70	130				

Sample ID: G1912E23-001LMS	SampType: MS	TestCode: EPA8260_VO	Units: µg/L	Prep Date:	RunNo: 226457
Client ID:	Batch ID: R226457	TestNo: EPA 8260 B		Analysis Date: 12/31/2019	SeqNo: 5677158

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	19.82	1.00	20	0	99.1	76	117				
1,1,1-Trichloroethane	21.03	1.00	20	0	105	72	122				
1,1,2,2-Tetrachloroethane	15.06	1.00	20	0	75.3	72	110				
1,1,2-Trichloro-1,2,2-Trifluoroethane	21.91	1.00	20	0	110	66	123				
1,1,2-Trichloroethane	17.48	1.00	20	0	87.4	76	126				
1,1-Dichloroethane	20.63	1.00	20	0	103	66	126				
1,1-Dichloroethene	21.36	1.00	20	0	107	66	121				
1,1-Dichloropropene	20.97	1.00	20	0	105	71	120				
1,2,3-Trichlorobenzene	9.699	5.00	20	0	48.5	43	148				
1,2,3-Trichloropropane	15.10	1.00	20	0	75.5	72	112				
1,2,3-Trimethylbenzene	18.54	1.00	20	0	92.7	74	118				
1,2,4-Trichlorobenzene	13.87	1.00	20	0	69.4	61	127				
1,2,4-Trimethylbenzene	18.61	1.00	20	0	93.1	78	128				
1,2-Dibromo-3-chloropropane	10.42	5.00	20	0	52.1	57	121				S
1,2-Dibromoethane	16.66	1.00	20	0	83.3	75	113				
1,2-Dichlorobenzene	17.71	1.00	20	0	88.6	76	108				
1,2-Dichloroethane	18.60	1.00	20	0	93.0	69	116				
1,2-Dichloropropane	19.67	1.00	20	0	98.4	78	122				
1,3,5-Trimethylbenzene	19.27	1.00	20	0	96.4	79	111				
1,3-Dichlorobenzene	18.34	1.00	20	0	91.7	71	120				
1,3-Dichloropropane	17.34	1.00	20	0	86.7	76	110				
1,4-Dichlorobenzene	17.99	1.00	20	0	89.9	70	121				
1,4-Dioxane	86.13	50.0	200	0	43.1	33	189				
1-Propanol	206.2	100	200	0	103	46	146				
2,2-Dichloropropane	21.95	1.00	20	0	110	29	160				
2-Butanone	12.72	5.00	20	0	63.6	59	118				
2-chloro-1,3-butadiene	21.50	1.00	20	0	107	74	122				
2-Chlorotoluene	19.59	1.00	20	0	97.9	76	115				
2-Hexanone	13.05	5.00	20	0	65.2	63	120				
2-Methyl-1-propanol	95.97	50.0	200	0	48.0	37	145				
2-Nitropropane	12.19	1.00	20	0	61.0	57	128				
2-Propanol	< 100	100	200	0	49.0	43	152				
3-Chloro-1-Propene	20.27	1.00	20	0	101	64	124				
4-Chlorotoluene	19.63	1.00	20	0	98.2	75	118				
4-Isopropyltoluene	18.85	1.00	20	0	94.3	76	114				
4-Methyl-2-Pentanone	16.07	1.00	20	0	80.4	68	116				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **G1912E23-001LMS** SampType: **MS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677158**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Acetone	12.21	10.0	20	0	61.0	51	133				
Acetonitrile	201.4	20.0	200	0	101	50	134				
Acrolein	< 10.0	10.0	20	0	45.6	8	140				
Acrylonitrile	13.40	5.00	20	0	67.0	64	122				
Benzene	20.34	1.00	20	0	102	52	125				
Benzyl chloride	13.30	5.00	20	0	66.5	13	141				
Bromobenzene	18.87	1.00	20	0	94.3	75	116				
Bromochloromethane	19.38	1.00	20	0	96.9	71	117				
Bromodichloromethane	19.89	1.00	20	0	99.4	68	132				
Bromoethane	21.02	1.00	20	0	105	72	124				
Bromoform	13.84	1.00	20	0	69.2	65	117				
Bromomethane	15.47	1.00	20	0	77.4	40	156				
Carbon Disulfide	20.34	1.00	20	0	102	60	123				
Carbon Tetrachloride	21.20	1.00	20	0	106	67	132				
Chlorobenzene	18.98	1.00	20	0	94.9	78	111				
Chlorodibromomethane	16.87	1.00	20	0	84.3	70	123				
Chloroethane	24.32	1.00	20	0	122	46	132				
Chloroform	19.77	1.00	20	0	98.9	69	117				
Chloromethane	20.22	1.00	20	0	101	51	129				
Chloroprene	21.50	1.00	20	0	107	68	120				
cis-1,2-Dichloroethene	20.37	1.00	20	0	102	71	117				
cis-1,3-Dichloropropene	19.32	1.00	20	0	96.6	71	117				
Cyclohexane	21.45	5.00	20	0	107	73	120				
Cyclohexanone	< 10.0	10.0	20	0	37.3	41	143				S
Dibromomethane	17.73	1.00	20	0	88.7	77	110				
Dichlorobromomethane	19.89	1.00	20	0	99.4	74	117				
Dichlorodifluoromethane	26.45	1.00	20	0	132	34	140				
Dichlorofluoromethane	22.66	1.00	20	0	113	70	123				
Diethyl Ether	19.29	5.00	20	0	96.4	54	142				
Dimethoxymethane	13.47	1.00	20	0	67.4	60	134				
Ethyl acetate	13.35	5.00	20	0	66.8	50	128				
Ethyl Methacrylate	15.10	1.00	20	0	75.5	71	127				
Ethylbenzene	19.58	1.00	20	0	97.9	72	122				
Hexachlorobutadiene	15.28	5.00	20	0	76.4	63	129				
Hexachloroethane	17.60	5.00	20	0	88.0	59	123				
Iodomethane	24.59	5.00	20	0	123	34	150				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: G1912E23-001LMS	SampType: MS	TestCode: EPA8260_VO	Units: µg/L	Prep Date:	RunNo: 226457
Client ID:	Batch ID: R226457	TestNo: EPA 8260 B		Analysis Date: 12/31/2019	SeqNo: 5677158

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Isobutyl alcohol	95.97	50.0	200	0	48.0	38	142				
Isopropylbenzene	19.26	1.00	20	0	96.3	73	124				
m,p-Xylene	39.23	2.00	40	0	98.1	75	119				
Methacrylonitrile	144.8	10.0	200	0	72.4	65	119				
Methyl Acetate	129.3	10.0	200	0	64.6	57	112				
Methyl Ethyl Ketone	12.72	5.00	20	0	63.6	59	121				
Methyl methacrylate	14.74	1.00	20	0	73.7	71	121				
Methylcyclohexane	20.71	1.00	20	0	104	70	118				
Methylene Chloride	19.76	1.00	20	0	98.8	64	121				
Methyl-tert-butyl ether	17.59	1.00	20	0	88.0	71	123				
Naphthalene	8.082	5.00	20	0	40.4	48	140				S
n-Butanol	83.27	20.0	200	0	41.6	30	146				
n-Butylbenzene	18.50	1.00	20	0	92.5	68	131				
n-Propylbenzene	19.31	1.00	20	0	96.5	72	124				
o-Xylene	19.02	1.00	20	0	95.1	76	118				
Pentachloroethane	18.24	2.00	20	0	91.2	70	122				
p-Isopropyltoluene	18.85	1.00	20	0	94.3	76	114				
Propionitrile	121.8	10.0	200	0	60.9	59	122				
sec-Butylbenzene	18.44	1.00	20	0	92.2	73	120				
Styrene	18.95	1.00	20	0	94.8	78	117				
tert-Butylbenzene	19.34	1.00	20	0	96.7	73	121				
Tetrachloroethene	20.27	1.00	20	0	101	67	122				
Tetrahydrofuran	12.26	5.00	20	0	61.3	44	135				
Toluene	20.13	1.00	20	0	101	75	115				
Total Xylene	58.25	2.00	60	0	97.1	72	120				
trans-1,2-Dichloroethene	21.48	1.00	20	0	107	69	118				
trans-1,3-Dichloropropene	17.82	1.00	20	0	89.1	66	122				
trans-1,4-Dichloro-2-butene	12.50	2.00	20	0	62.5	46	131				
Tribromomethane	13.84	1.00	20	0	69.2	65	117				
Trichloroethene	20.76	1.00	20	0	104	75	117				
Trichlorofluoromethane	22.43	1.00	20	0	112	69	125				
Trichloromethane	19.77	1.00	20	0	98.9	69	117				
Vinyl Acetate	18.48	1.00	20	0	92.4	46	126				
Vinyl Chloride	22.72	1.00	20	0	114	54	128				
Surr: 1,2-Dichloroethane-d4	27.59	0	30	0	92.0	70	130				
Surr: 4-Bromofluorobenzene	29.78	0	30	0	99.3	70	130				

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **G1912E23-001LMS** SampType: **MS** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677158**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Dibromofluoromethane	30.55	0	30	0	102	70	130				
Surr: Toluene-d8	30.02	0	30	0	100	70	130				
pH	< 0	0	0	0	0	0	0				

Sample ID: **G1912E23-001LMSD** SampType: **MSD** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677159**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	19.19	1.00	20	0	96.0	76	117	19.82	3.24	11	
1,1,1-Trichloroethane	20.89	1.00	20	0	104	72	122	21.03	0.668	12	
1,1,2,2-Tetrachloroethane	14.20	1.00	20	0	71.0	72	110	15.06	5.84	14	S
1,1,2-Trichloro-1,2,2-Trifluoroethane	21.50	1.00	20	0	108	66	123	21.91	1.90	24	
1,1,2-Trichloroethane	17.36	1.00	20	0	86.8	76	126	17.48	0.741	15	
1,1-Dichloroethane	20.31	1.00	20	0	102	66	126	20.63	1.52	12	
1,1-Dichloroethene	20.95	1.00	20	0	105	66	121	21.36	1.94	14	
1,1-Dichloropropene	21.20	1.00	20	0	106	71	120	20.97	1.08	13	
1,2,3-Trichlorobenzene	12.63	5.00	20	0	63.1	43	148	9.699	26.2	30	
1,2,3-Trichloropropane	13.31	1.00	20	0	66.6	72	112	15.1	12.6	14	S
1,2,3-Trimethylbenzene	19.06	1.00	20	0	95.3	74	118	18.54	2.74	22	
1,2,4-Trichlorobenzene	15.93	1.00	20	0	79.6	61	127	13.87	13.8	23	
1,2,4-Trimethylbenzene	18.95	1.00	20	0	94.7	78	128	18.61	1.79	13	
1,2-Dibromo-3-chloropropane	11.42	5.00	20	0	57.1	57	121	10.42	9.12	20	
1,2-Dibromoethane	17.32	1.00	20	0	86.6	75	113	16.66	3.89	17	
1,2-Dichlorobenzene	18.31	1.00	20	0	91.5	76	108	17.71	3.32	13	
1,2-Dichloroethane	18.95	1.00	20	0	94.8	69	116	18.6	1.87	11	
1,2-Dichloropropane	19.82	1.00	20	0	99.1	78	122	19.67	0.714	12	
1,3,5-Trimethylbenzene	19.40	1.00	20	0	97.0	79	111	19.27	0.652	13	
1,3-Dichlorobenzene	18.70	1.00	20	0	93.5	71	120	18.34	1.93	16	
1,3-Dichloropropane	18.10	1.00	20	0	90.5	76	110	17.34	4.31	17	
1,4-Dichlorobenzene	18.29	1.00	20	0	91.4	70	121	17.99	1.66	16	
1,4-Dioxane	96.98	50.0	200	0	48.5	33	189	86.13	11.8	41	
1-Propanol	201.1	100	200	0	101	46	146	206.2	2.50	38	
2,2-Dichloropropane	22.05	1.00	20	0	110	29	160	21.95	0.436	13	
2-Butanone	12.33	5.00	20	0	61.6	59	118	12.72	3.12	23	
2-chloro-1,3-butadiene	21.70	1.00	20	0	109	74	122	21.5	0.972	12	

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **G1912E23-001LMSD** SampType: **MSD** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677159**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
2-Chlorotoluene	18.88	1.00	20	0	94.4	76	115	19.59	3.68	16	
2-Hexanone	12.23	5.00	20	0	61.1	63	120	13.05	6.51	18	S
2-Methyl-1-propanol	102.6	50.0	200	0	51.3	37	145	95.97	6.69	24	
2-Nitropropane	11.88	1.00	20	0	59.4	57	128	12.19	2.58	17	
2-Propanol	106.3	100	200	0	53.1	43	152	97.92	8.19	31	
3-Chloro-1-Propene	20.62	1.00	20	0	103	64	124	20.27	1.74	24	
4-Chlorotoluene	19.52	1.00	20	0	97.6	75	118	19.63	0.593	15	
4-Isopropyltoluene	19.44	1.00	20	0	97.2	76	114	18.85	3.10	13	
4-Methyl-2-Pentanone	16.04	1.00	20	0	80.2	68	116	16.07	0.187	18	
Acetone	12.35	10.0	20	0	61.8	51	133	12.21	1.18	23	
Acetonitrile	211.8	20.0	200	0	106	50	134	201.4	5.02	28	
Acrolein	< 10.0	10.0	20	0	42.2	8	140	9.126	0	25	
Acrylonitrile	13.20	5.00	20	0	66.0	64	122	13.4	1.46	16	
Benzene	20.44	1.00	20	0	102	52	125	20.34	0.515	15	
Benzyl chloride	13.17	5.00	20	0	65.9	13	141	13.3	0.929	22	
Bromobenzene	18.35	1.00	20	0	91.7	75	116	18.87	2.78	15	
Bromochloromethane	20.16	1.00	20	0	101	71	117	19.38	3.93	12	
Bromodichloromethane	20.50	1.00	20	0	102	68	132	19.89	3.04	18	
Bromoethane	21.24	1.00	20	0	106	72	124	21.02	1.03	22	
Bromoform	14.23	1.00	20	0	71.2	65	117	13.84	2.76	14	
Bromomethane	14.62	1.00	20	0	73.1	40	156	15.47	5.66	22	
Carbon Disulfide	20.69	1.00	20	0	103	60	123	20.34	1.71	13	
Carbon Tetrachloride	21.75	1.00	20	0	109	67	132	21.2	2.57	12	
Chlorobenzene	19.15	1.00	20	0	95.8	78	111	18.98	0.907	10	
Chlorodibromomethane	17.47	1.00	20	0	87.4	70	123	16.87	3.54	16	
Chloroethane	24.35	1.00	20	0	122	46	132	24.32	0.111	17	
Chloroform	20.33	1.00	20	0	102	69	117	19.77	2.78	13	
Chloromethane	21.51	1.00	20	0	108	51	129	20.22	6.18	16	
Chloroprene	21.70	1.00	20	0	109	68	120	21.5	0.972	13	
cis-1,2-Dichloroethene	21.01	1.00	20	0	105	71	117	20.37	3.10	12	
cis-1,3-Dichloropropene	19.90	1.00	20	0	99.5	71	117	19.32	2.93	16	
Cyclohexane	21.30	5.00	20	0	107	73	120	21.45	0.697	13	
Cyclohexanone	< 10.0	10.0	20	0	46.8	41	143	7.466	0	24	
Dibromomethane	17.87	1.00	20	0	89.3	77	110	17.73	0.742	14	
Dichlorobromomethane	20.50	1.00	20	0	102	74	117	19.89	3.04	13	
Dichlorodifluoromethane	25.27	1.00	20	0	126	34	140	26.45	4.58	18	

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: **G1912E23-001LMSD** SampType: **MSD** TestCode: **EPA8260_VO** Units: **µg/L** Prep Date: RunNo: **226457**
Client ID: Batch ID: **R226457** TestNo: **EPA 8260 B** Analysis Date: **12/31/2019** SeqNo: **5677159**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorofluoromethane	22.79	1.00	20	0	114	70	123	22.66	0.546	17	
Diethyl Ether	18.54	5.00	20	0	92.7	54	142	19.29	3.95	18	
Dimethoxymethane	13.15	1.00	20	0	65.8	60	134	13.47	2.42	21	
Ethyl acetate	13.04	5.00	20	0	65.2	50	128	13.35	2.41	22	
Ethyl Methacrylate	15.68	1.00	20	0	78.4	71	127	15.1	3.79	17	
Ethylbenzene	19.58	1.00	20	0	97.9	72	122	19.58	0.0204	16	
Hexachlorobutadiene	17.68	5.00	20	0	88.4	63	129	15.28	14.5	21	
Hexachloroethane	18.60	5.00	20	0	93.0	59	123	17.6	5.54	17	
Iodomethane	24.33	5.00	20	0	122	34	150	24.59	1.05	19	
Isobutyl alcohol	102.6	50.0	200	0	51.3	38	142	95.97	6.69	23	
Isopropylbenzene	19.74	1.00	20	0	98.7	73	124	19.26	2.46	15	
m,p-Xylene	38.88	2.00	40	0	97.2	75	119	39.23	0.881	14	
Methacrylonitrile	141.4	10.0	200	0	70.7	65	119	144.8	2.39	14	
Methyl Acetate	129.2	10.0	200	0	64.6	57	112	129.3	0.0627	25	
Methyl Ethyl Ketone	12.33	5.00	20	0	61.6	59	121	12.72	3.12	21	
Methyl methacrylate	14.42	1.00	20	0	72.1	71	121	14.74	2.20	14	
Methylcyclohexane	20.45	1.00	20	0	102	70	118	20.71	1.28	12	
Methylene Chloride	20.24	1.00	20	0	101	64	121	19.76	2.37	17	
Methyl-tert-butyl ether	17.27	1.00	20	0	86.3	71	123	17.59	1.87	14	
Naphthalene	10.30	5.00	20	0	51.5	48	140	8.082	24.1	33	
n-Butanol	96.85	20.0	200	0	48.4	30	146	83.27	15.1	21	
n-Butylbenzene	19.23	1.00	20	0	96.2	68	131	18.5	3.87	14	
n-Propylbenzene	19.19	1.00	20	0	95.9	72	124	19.31	0.634	15	
o-Xylene	19.05	1.00	20	0	95.2	76	118	19.02	0.158	12	
Pentachloroethane	18.08	2.00	20	0	90.4	70	122	18.24	0.908	14	
p-Isopropyltoluene	19.44	1.00	20	0	97.2	76	114	18.85	3.10	13	
Propionitrile	121.5	10.0	200	0	60.7	59	122	121.8	0.249	22	
sec-Butylbenzene	19.37	1.00	20	0	96.9	73	120	18.44	4.91	13	
Styrene	19.38	1.00	20	0	96.9	78	117	18.95	2.22	12	
tert-Butylbenzene	19.45	1.00	20	0	97.2	73	121	19.34	0.572	17	
Tetrachloroethene	20.93	1.00	20	0	105	67	122	20.27	3.24	16	
Tetrahydrofuran	12.50	5.00	20	0	62.5	44	135	12.26	1.94	21	
Toluene	20.64	1.00	20	0	103	75	115	20.13	2.48	13	
Total Xylene	57.93	2.00	60	0	96.6	72	120	58.25	0	18	
trans-1,2-Dichloroethene	21.37	1.00	20	0	107	69	118	21.48	0.523	13	
trans-1,3-Dichloropropene	18.54	1.00	20	0	92.7	66	122	17.82	3.94	15	

ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8260_VOA

Sample ID: G1912E23-001LMSD	SampType: MSD	TestCode: EPA8260_VO	Units: µg/L	Prep Date:	RunNo: 226457
Client ID:	Batch ID: R226457	TestNo: EPA 8260 B		Analysis Date: 12/31/2019	SeqNo: 5677159

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
trans-1,4-Dichloro-2-butene	11.97	2.00	20	0	59.8	46	131	12.5	4.33	17	
Tribromomethane	14.23	1.00	20	0	71.2	65	117	13.84	2.76	13	
Trichloroethene	21.01	1.00	20	0	105	75	117	20.76	1.19	11	
Trichlorofluoromethane	21.87	1.00	20	0	109	69	125	22.43	2.52	15	
Trichloromethane	20.33	1.00	20	0	102	69	117	19.77	2.78	12	
Vinyl Acetate	18.57	1.00	20	0	92.8	46	126	18.48	0.475	11	
Vinyl Chloride	23.60	1.00	20	0	118	54	128	22.72	3.80	15	
Surr: 1,2-Dichloroethane-d4	27.98	0	30	0	93.3	70	130	27.59	0	0	
Surr: 4-Bromofluorobenzene	29.54	0	30	0	98.5	70	130	29.78	0	0	
Surr: Dibromofluoromethane	31.44	0	30	0	105	70	130	30.55	0	0	
Surr: Toluene-d8	28.91	0	30	0	96.4	70	130	30.02	0	0	
pH	< 0	0	0	0	0	0	0	0	0	0	

ANALYTICAL QC SUMMARY REPORT

TestCode: IC_300.0_28

Sample ID: **LRB** SampType: **LRB** TestCode: **IC_300.0_28** Units: **mg/L** Prep Date: RunNo: **226473**
Client ID: Batch ID: **R226473** TestNo: **EPA 300.0** Analysis Date: **12/31/2019** SeqNo: **5677463**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	< 0.200	0.200									
Chloride	< 1.00	1.00									
Fluoride	< 0.100	0.100									
Sulfate	< 2.00	2.00									

Sample ID: **G1912F53-001BLFM** SampType: **LFM** TestCode: **IC_300.0_28** Units: **mg/L** Prep Date: **12/31/2019** RunNo: **226473**
Client ID: Batch ID: **171917** TestNo: **EPA 300.0** Analysis Date: **12/31/2019** SeqNo: **5677469**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	20.90	1.00	15	6.8194	93.9	80	120				
Sulfate	506.2	2.00	20	494.41	58.9	80	120				1

Sample ID: **G1912F79-001BLFM** SampType: **LFM** TestCode: **IC_300.0_28** Units: **mg/L** Prep Date: **12/31/2019** RunNo: **226473**
Client ID: Batch ID: **171917** TestNo: **EPA 300.0** Analysis Date: **12/31/2019** SeqNo: **5677476**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.225	0.100	2.5	0	89.0	80	120				

Sample ID: **LRB** SampType: **LRB** TestCode: **IC_300.0_28** Units: **mg/L** Prep Date: RunNo: **226473**
Client ID: Batch ID: **R226473** TestNo: **EPA 300.0** Analysis Date: **12/31/2019** SeqNo: **5677483**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	< 0.200	0.200									
Chloride	< 1.00	1.00									
Fluoride	< 0.100	0.100									
Sulfate	< 2.00	2.00									

Sample ID: **LFB** SampType: **LFB** TestCode: **IC_300.0_28** Units: **mg/L** Prep Date: RunNo: **226505**
Client ID: Batch ID: **171942** TestNo: **EPA 300.0** Analysis Date: **1/2/2020** SeqNo: **5678054**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	4.932	0.200	5	0	98.6	90	110				
Chloride	48.97	1.00	50	0	97.9	90	110				
Fluoride	5.005	0.100	5	0	100	90	110				
Sulfate	48.53	2.00	50	0	97.1	90	110				

ANALYTICAL QC SUMMARY REPORT

TestCode: IC_300.0_28

Sample ID: LRB	SampType: LRB	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678056

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	< 0.200	0.200									
Chloride	< 1.00	1.00									
Fluoride	< 0.100	0.100									
Sulfate	< 2.00	2.00									

Sample ID: QCS	SampType: QCS	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678057

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	8.163	0.200	8	0	102	90	110				
Chloride	23.20	1.00	24	0	96.7	90	110				
Fluoride	3.995	0.100	4	0	99.9	90	110				
Sulfate	31.20	2.00	32	0	97.5	90	110				

Sample ID: HRQC	SampType: HRQC	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678058

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	252.4	1.00	250	0	101	90	110				
Sulfate	252.0	2.00	250	0	101	90	110				

Sample ID: G2001019-002DLFM	SampType: LFM	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678071

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	418.2	1.00	15	418.26	-0.253	80	120				
Fluoride	2.535	0.100	2.5	0.076064	98.4	80	120				1
Sulfate	275.4	2.00	20	257.54	89.3	80	120				

Sample ID: G2001024-001DLFM	SampType: LFM	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678080

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	21.74	1.00	15	9.0319	84.7	80	120				
Fluoride	2.460	0.100	2.5	0.11968	93.6	80	120				

ANALYTICAL QC SUMMARY REPORT

TestCode: IC_300.0_28

Sample ID: G2001024-001DLFM	SampType: LFM	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678080

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	34.54	2.00	20	17.261	86.4	80	120				

Sample ID: G1912F79-001BLFM	SampType: LFM	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678085

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	11820	10.0	150	12021	-132	80	120				1

Sample ID: LFB	SampType: LFB	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/3/2020	SeqNo: 5678092

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	4.873	0.200	5	0	97.5	90	110				
Chloride	48.53	1.00	50	0	97.1	90	110				
Fluoride	4.961	0.100	5	0	99.2	90	110				
Sulfate	47.86	2.00	50	0	95.7	90	110				

Sample ID: LRB	SampType: LRB	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/3/2020	SeqNo: 5678094

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	< 0.200	0.200									
Chloride	< 1.00	1.00									
Fluoride	< 0.100	0.100									
Sulfate	< 2.00	2.00									

Sample ID: QCS	SampType: QCS	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/3/2020	SeqNo: 5678095

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	8.165	0.200	8	0	102	90	110				
Chloride	23.22	1.00	24	0	96.8	90	110				
Fluoride	4.000	0.100	4	0	100	90	110				
Sulfate	31.11	2.00	32	0	97.2	90	110				

ANALYTICAL QC SUMMARY REPORT

TestCode: IC_300.0_28

Sample ID: HRQC	SampType: HRQC	TestCode: IC_300.0_28	Units: mg/L	Prep Date:	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/3/2020	SeqNo: 5678096

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	252.5	1.00	250	0	101	90	110				
Sulfate	250.6	2.00	250	0	100	90	110				

Sample ID: G1912F53-001BDUP	SampType: DUP	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 12/31/2019	RunNo: 226473
Client ID:	Batch ID: 171917	TestNo: EPA 300.0		Analysis Date: 12/31/2019	SeqNo: 5677468

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	6.824	1.00						6.819	0.0688	20	
Sulfate	492.8	2.00						494.4	0.333	20	

Sample ID: G1912F79-001BDUP	SampType: DUP	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 12/31/2019	RunNo: 226473
Client ID:	Batch ID: 171917	TestNo: EPA 300.0		Analysis Date: 12/31/2019	SeqNo: 5677475

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	< 0.100	0.100						0	0	20	

Sample ID: G2001019-002DDUP	SampType: DUP	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678070

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	416.8	1.00						418.3	0.359	20	
Fluoride	< 0.100	0.100						0.07606	0	20	
Sulfate	256.8	2.00						257.5	0.271	20	

Sample ID: G2001024-001DDUP	SampType: DUP	TestCode: IC_300.0_28	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226505
Client ID:	Batch ID: 171942	TestNo: EPA 300.0		Analysis Date: 1/2/2020	SeqNo: 5678079

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	9.007	1.00						9.032	0.281	20	
Fluoride	0.1207	0.100						0.1197	0.871	20	
Sulfate	17.32	2.00						17.26	0.331	20	

ANALYTICAL QC SUMMARY REPORT

TestCode: IC_300.0_28

Sample ID: **G1912F79-001BDUP** SampType: **DUP** TestCode: **IC_300.0_28** Units: **mg/L** Prep Date: **1/2/2020** RunNo: **226505**
Client ID: Batch ID: **171942** TestNo: **EPA 300.0** Analysis Date: **1/2/2020** SeqNo: **5678084**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	11910	10.0						12020	0.939	20	

ANALYTICAL QC SUMMARY REPORT

TestCode: ME_3010_6010

Sample ID: **LCS1-171935** SampType: **LCS1** TestCode: **ME_3010_60** Units: **mg/L** Prep Date: **1/2/2020** RunNo: **226482**
Client ID: Batch ID: **171935** TestNo: **EPA 6010** Analysis Date: **1/2/2020** SeqNo: **5677570**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.9160	0.100	1	0	91.6	85	115				
Arsenic	0.9785	0.0200	1	0	97.9	85	115				
Barium	1.001	0.0100	1	0	100	85	115				
Beryllium	0.1965	0.00100	0.2	0	98.3	85	115				
Cadmium	0.3931	0.00200	0.4	0	98.3	85	115				
Calcium	9.952	0.100	10	0	99.5	85	115				
Chromium	0.9803	0.0100	1	0	98.0	85	115				
Cobalt	0.3963	0.00500	0.4	0	99.1	85	115				
Copper	0.9922	0.0100	1	0	99.2	85	115				
Iron	9.963	0.0500	10	0	99.6	85	115				
Lead	1.001	0.0200	1	0	100	85	115				
Magnesium	1.949	0.100	2	0	97.5	85	115				
Manganese	0.9975	0.0100	1	0	99.8	85	115				
Molybdenum	0.3716	0.0200	0.4	0	92.9	85	115				
Nickel	0.9881	0.0100	1	0	98.8	85	115				
Potassium	9.570	0.500	10	0	95.7	85	115				
Selenium	0.9304	0.0200	1	0	93.0	85	115				
Silver	0.009800	0.00500	0.01	0	98.0	85	115				
Sodium	9.940	0.200	10	0	99.4	85	115				
Strontium	0.9938	0.0100	1	0	99.4	85	115				
Sulfur	18.62	0.100	20	0	93.1	85	115				
Thallium	1.014	0.0200	1	0	101	85	115				
Tin	0.9508	0.100	1	0	95.1	85	115				
Titanium	0.9893	0.00500	1	0	98.9	85	115				
Vanadium	0.3766	0.00500	0.4	0	94.1	85	115				
Zinc	0.9923	0.0100	1	0	99.2	85	115				

Sample ID: **PB-171935** SampType: **PB** TestCode: **ME_3010_60** Units: **mg/L** Prep Date: **1/2/2020** RunNo: **226756**
Client ID: Batch ID: **171935** TestNo: **EPA 6010** Analysis Date: **1/9/2020** SeqNo: **5684782**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Boron	< 0.0500	0.0500									

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: ME_3010_6010

Sample ID: LCS1-171935	SampType: LCS1	TestCode: ME_3010_60	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226756
Client ID:	Batch ID: 171935	TestNo: EPA 6010		Analysis Date: 1/9/2020	SeqNo: 5684785

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Boron	1.012	0.0500	1	0	101	85	115				

Sample ID: G1912F78-001DMS	SampType: MS	TestCode: ME_3010_60	Units: mg/L	Prep Date: 1/2/2020	RunNo: 226482
Client ID: Field Dup	Batch ID: 171935	TestNo: EPA 6010		Analysis Date: 1/2/2020	SeqNo: 5677573

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	1.179	0.100	1	0	118	75	125				
Arsenic	1.274	0.0200	1	0	127	75	125				NA
Barium	3.293	0.0100	1	2.342	95.1	75	125				
Beryllium	0.1932	0.00100	0.2	0	96.6	75	125				
Cadmium	0.4072	0.00200	0.4	0	102	75	125				
Calcium	170.2	0.100	10	164.9	53.0	75	125				1
Chromium	1.029	0.0100	1	0	103	75	125				
Cobalt	0.3875	0.00500	0.4	0	96.9	75	125				
Copper	1.255	0.0100	1	0	125	75	125				NA
Iron	10.56	0.0500	10	0.3913	102	75	125				
Lead	0.9629	0.0200	1	0	96.3	75	125				
Magnesium	63.21	0.100	2	64.52	-65.5	75	125				1
Manganese	1.003	0.0100	1	0.0809	92.2	75	125				
Molybdenum	0.3964	0.0200	0.4	0	99.1	75	125				
Nickel	0.9806	0.0100	1	0	98.1	75	125				
Potassium	55.36	0.500	10	42.3	131	75	125				1
Selenium	1.214	0.0200	1	0	121	75	125				
Silver	0.01220	0.00500	0.01	0	122	75	125				
Sodium	3552	0.200	10	3940	-3880	75	125				1
Strontium	10.88	0.0100	1	10.04	84.0	75	125				
Thallium	0.8789	0.0200	1	0	87.9	75	125				
Tin	0.9404	0.100	1	0	94.0	75	125				
Titanium	0.7655	0.00500	1	0	76.6	75	125				
Vanadium	0.2974	0.00500	0.4	0	74.3	75	125				NA
Zinc	1.329	0.0100	1	0	133	75	125				NA

ANALYTICAL QC SUMMARY REPORT

TestCode: ME_3010_6010

Sample ID: **G1912F78-001DMS** SampType: **MS** TestCode: **ME_3010_60** Units: **mg/L** Prep Date: **1/2/2020** RunNo: **226756**
Client ID: **Field Dup** Batch ID: **171935** TestNo: **EPA 6010** Analysis Date: **1/9/2020** SeqNo: **5684730**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Boron	2.479	0.0500	1	1.4157	106	75	125				

Sample ID: **G1912F78-001DDUP** SampType: **DUP** TestCode: **ME_3010_60** Units: **mg/L** Prep Date: **1/2/2020** RunNo: **226482**
Client ID: **Field Dup** Batch ID: **171935** TestNo: **EPA 6010** Analysis Date: **1/2/2020** SeqNo: **5677572**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	< 0.100	0.100						0	0	20	
Arsenic	< 0.0200	0.0200						0	0	20	
Barium	2.331	0.0100						2.342	0.471	20	
Beryllium	< 0.00100	0.00100						0	0	20	
Cadmium	< 0.00200	0.00200						0	0	20	
Calcium	163.7	0.100						164.9	0.730	20	
Chromium	< 0.0100	0.0100						0	0	20	
Cobalt	< 0.00500	0.00500						0	0	20	
Copper	< 0.0100	0.0100						0	0	20	
Iron	0.3842	0.0500						0.3913	1.83	20	
Lead	< 0.0200	0.0200						0	0	20	
Magnesium	62.52	0.100						64.52	3.15	20	
Manganese	0.07960	0.0100						0.0809	1.62	20	
Molybdenum	< 0.0200	0.0200						0	0	20	
Nickel	< 0.0100	0.0100						0	0	20	
Potassium	42.71	0.500						42.3	0.965	20	
Selenium	< 0.0200	0.0200						0	0	20	
Silver	< 0.00500	0.00500						0	0	20	
Sodium	3691	0.200						3940	6.53	20	
Strontium	9.998	0.0100						10.04	0.419	20	
Thallium	< 0.0200	0.0200						0	0	20	
Tin	< 0.100	0.100						0	0	20	
Titanium	< 0.00500	0.00500						0	0	20	
Vanadium	< 0.00500	0.00500						0	0	20	
Zinc	< 0.0100	0.0100						0	0	20	

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: ME_3010_6010

Sample ID: G1912F78-001DDUP	SampType: DUP	TestCode: ME_3010_60	Units mg/L	Prep Date: 1/2/2020	RunNo: 226756
Client ID: Field Dup	Batch ID: 171935	TestNo: EPA 6010		Analysis Date: 1/9/2020	SeqNo: 5684727

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Boron	1.420	0.0500						1.416	0.331	20	

ANALYTICAL QC SUMMARY REPORT

TestCode: NH3_350.1

Sample ID: LCS	SampType: LCS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678193

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.7636	0.100	0.82	0	93.1	90	110				

Sample ID: LCS	SampType: LCS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678215

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.7509	0.100	0.82	0	91.6	90	110				

Sample ID: LCS	SampType: LCS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678242

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.7479	0.100	0.82	0	91.2	90	110				

Sample ID: LCS	SampType: LCS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678271

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.7674	0.100	0.82	0	93.6	90	110				

Sample ID: LCS	SampType: LCS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678300

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.7392	0.100	0.82	0	90.1	90	110				

Sample ID: G1912F15-002AMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678196

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.006	0.100	1	0	101	90	110				

ANALYTICAL QC SUMMARY REPORT

TestCode: NH3_350.1

Sample ID: G2001019-001CMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678220

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.535	0.100	1	0.5172	102	90	110				

Sample ID: G2001022-001CMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678230

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.002	0.100	1	0.04053	96.1	90	110				

Sample ID: G2001038-002AMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678246

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.034	0.100	1	0.057574	97.6	90	110				

Sample ID: G2001064-003AMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678259

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.432	0.100	1	0.48012	95.1	90	110				

Sample ID: G2001067-002BMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678274

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.9917	0.100	1	0.060515	93.1	90	110				

Sample ID: G2001094-001AMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678304

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.099	0.100	1	0.17973	92.0	90	110				

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
Work Order: G1912F78
Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: NH3_350.1

Sample ID: G2001121-001BMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678316

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.9080	0.100	1	0	90.8	90	110				

Sample ID: G2001001-003AMS	SampType: MS	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678325

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	1.007	0.100	1	0.058275	94.9	90	110				

Sample ID: G1912F15-002ADUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678195

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	< 0.100	0.100						0	0	20	

Sample ID: G2001019-001CDUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678219

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.5149	0.100						0.5172	0.440	20	

Sample ID: G2001022-001CDUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678229

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	< 0.100	0.100						0.04053	0	20	

Sample ID: G2001038-002ADUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678245

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	< 0.100	0.100						0.05757	0	20	

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
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Project: Buckeye Brine Injection Facility

ANALYTICAL QC SUMMARY REPORT

TestCode: NH3_350.1

Sample ID: G1912D36-001BDU	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678248

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.1302	0.100						0.1369	5.05	20	

Sample ID: G2001064-003ADUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678258

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.4858	0.100						0.4801	1.17	20	

Sample ID: G2001067-002BDUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678273

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	< 0.100	0.100						0.06052	0	20	

Sample ID: G2001094-001ADUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678303

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	0.1818	0.100						0.1797	1.16	20	

Sample ID: G2001121-001BDUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678315

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	< 0.100	0.100						0	0	20	

Sample ID: G2001001-003ADUP	SampType: DUP	TestCode: NH3_350.1	Units: mg/L as N	Prep Date:	RunNo: 226510
Client ID:	Batch ID: R226510	TestNo: EPA 350.1		Analysis Date: 1/3/2020	SeqNo: 5678324

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia Nitrogen	< 0.100	0.100						0.05828	0	20	

ANALYTICAL QC SUMMARY REPORT

TestCode: PH_4500_HB

Sample ID: pH LCS 7	SampType: LCS	TestCode: PH_4500_HB	Units: S.U.	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: SM 4500-H+		Analysis Date: 1/2/2020	SeqNo: 5677773

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lab pH	7.030	0	7	0	100	98	102				

Sample ID: pH LCS 7	SampType: LCS	TestCode: PH_4500_HB	Units: S.U.	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: SM 4500-H+		Analysis Date: 1/2/2020	SeqNo: 5677799

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lab pH	7.050	0	7	0	101	98	102				

Sample ID: pH LCS 7	SampType: LCS	TestCode: PH_4500_HB	Units: S.U.	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: SM 4500-H+		Analysis Date: 1/2/2020	SeqNo: 5677842

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lab pH	7.070	0	7	0	101	98	102				

Sample ID: G1912F69-002ADUP	SampType: DUP	TestCode: PH_4500_HB	Units: S.U.	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: SM 4500-H+		Analysis Date: 1/2/2020	SeqNo: 5677781

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lab pH	7.450	0						7.44	0.134	20	H

Sample ID: G2001022-001ADUP	SampType: DUP	TestCode: PH_4500_HB	Units: S.U.	Prep Date:	RunNo: 226495
Client ID:	Batch ID: R226495	TestNo: SM 4500-H+		Analysis Date: 1/2/2020	SeqNo: 5677817

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lab pH	7.540	0						7.54	0	20	H

CLIENT: CIVIL & ENVIRONMENTAL-COLUMB
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ANALYTICAL QC SUMMARY REPORT

TestCode: TDS_SM 2540-C

Sample ID: LCS-171920	SampType: LCS	TestCode: TDS_SM 254	Units: mg/L	Prep Date: 12/31/2019	RunNo: 226458
Client ID:	Batch ID: 171920	TestNo: SM 2540 C		Analysis Date: 12/31/2019	SeqNo: 5677178

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total dissolved solids	282.0	20.0	292	0	96.6	85	115				

Sample ID: G1912E84-001CDUP	SampType: DUP	TestCode: TDS_SM 254	Units: mg/L	Prep Date: 12/31/2019	RunNo: 226458
Client ID:	Batch ID: 171920	TestNo: SM 2540 C		Analysis Date: 12/31/2019	SeqNo: 5677167

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total dissolved solids	44.00	20.0						46	4.44	10	

Sample ID: G1912F24-001FDUP	SampType: DUP	TestCode: TDS_SM 254	Units: mg/L	Prep Date: 12/31/2019	RunNo: 226458
Client ID:	Batch ID: 171920	TestNo: SM 2540 C		Analysis Date: 12/31/2019	SeqNo: 5677169

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total dissolved solids	7320	100						7230	1.24	10	

GLOSSARY OF TERMS

Aliquot: A separate measured and representative portion of a sample used for analysis.

Analyte: The specific chemicals or components that a sample is used for analysis.

Acceptance Criteria: Specified limits established either from a method or by the laboratory for a target analyte.

Accuracy: The measured agreement between an observed value and an accepted reference value.

Corporate Detection Limit (CDL): The value based on method detection limits that may encompass multiple studies generated from several instruments. The CDL is based on the highest MDL study and is rounded to a useable value.

Corporate Quantitation Limit (CQL): The laboratory's lowest level of data quantification for reporting a target analyte at a concentration level that does not require use of data qualifiers. The CQL is calculated as two times the Corporate Detection Limit (CDL) or two times the CDL times any dilution factor.

Batch: Samples prepared or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is a group of one to twenty samples of the same defined matrix, meeting the above-mentioned conditions and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is comprised of prepared samples (extracts, digestates or concentrates) that are analyzed together as a group. An analytical batch can include prepared samples originating from various sample matrices and may exceed 20 samples.

Chain of Custody: A form that documents the possession of the samples from the time of collection to lab receipt. This record includes: sample matrix, the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses.

Equipment Blank: Sampling equipment rinsed with laboratory water immediately before use in sampling with the rinsing submitted to the laboratory as a sample for analysis. Data from the analysis of equipment blanks provides a check on sampling device cleanliness.

Field Duplicate: Two separate samples taken from the same source (e.g. monitoring well) and analyzed independently. The data obtained from field duplicate samples is used to evaluate the variability of the sampling procedures and the source from which the sample was obtained. There are no acceptance criteria for comparing field duplicate data results.

Laboratory Control Sample (LCS): A sample matrix, free from the analytes of interest, spiked with known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of a method.

Matrix: The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions are used:

- Aqueous: Any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents and TCLP or other extracts.
- Drinking water: Any aqueous sample designated a potable or potential potable water source.

- Non-aqueous Liquid: Any organic liquid with < 15% settleable solids.
- Solids: Includes soils, sediments, sludges and other matricies with > 15% settleable solids.
- Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.

Matrix Spike (MS): A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used to determine the effect of the matrix on a method's recovery efficiency. Calculation of recovery data is not quality assessed when the concentration of the target analyte in the unspiked sample is $\geq$ 4x the spiking concentration.

Matrix Spike Duplicate (MSD): A second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. Calculation of recovery data is not required when the concentration of the target analyte in the unspiked sample is $\geq$ 4x the spiking concentration.

Method Detection Limit: The minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in deionized water containing the analyte. MDLs are verified annually and are subject to change.

Preservation: Refrigeration and/or reagents added at the time of sample collection to maintain the chemical and/or biological integrity of the sample.

Recovery: The total amount of the analyte found in the sample divided by the amount of the analyte added into the sample as a spike.

Relative Percent Difference (RPD): The difference between two values divided by the average of the values, expressed as percent. Quality assessment on RPD is not used when at least one of the two values is $\leq$ 5x the reporting limit; assessment between the two values is based on whether the absolute difference is at or within 2x the reporting limit.

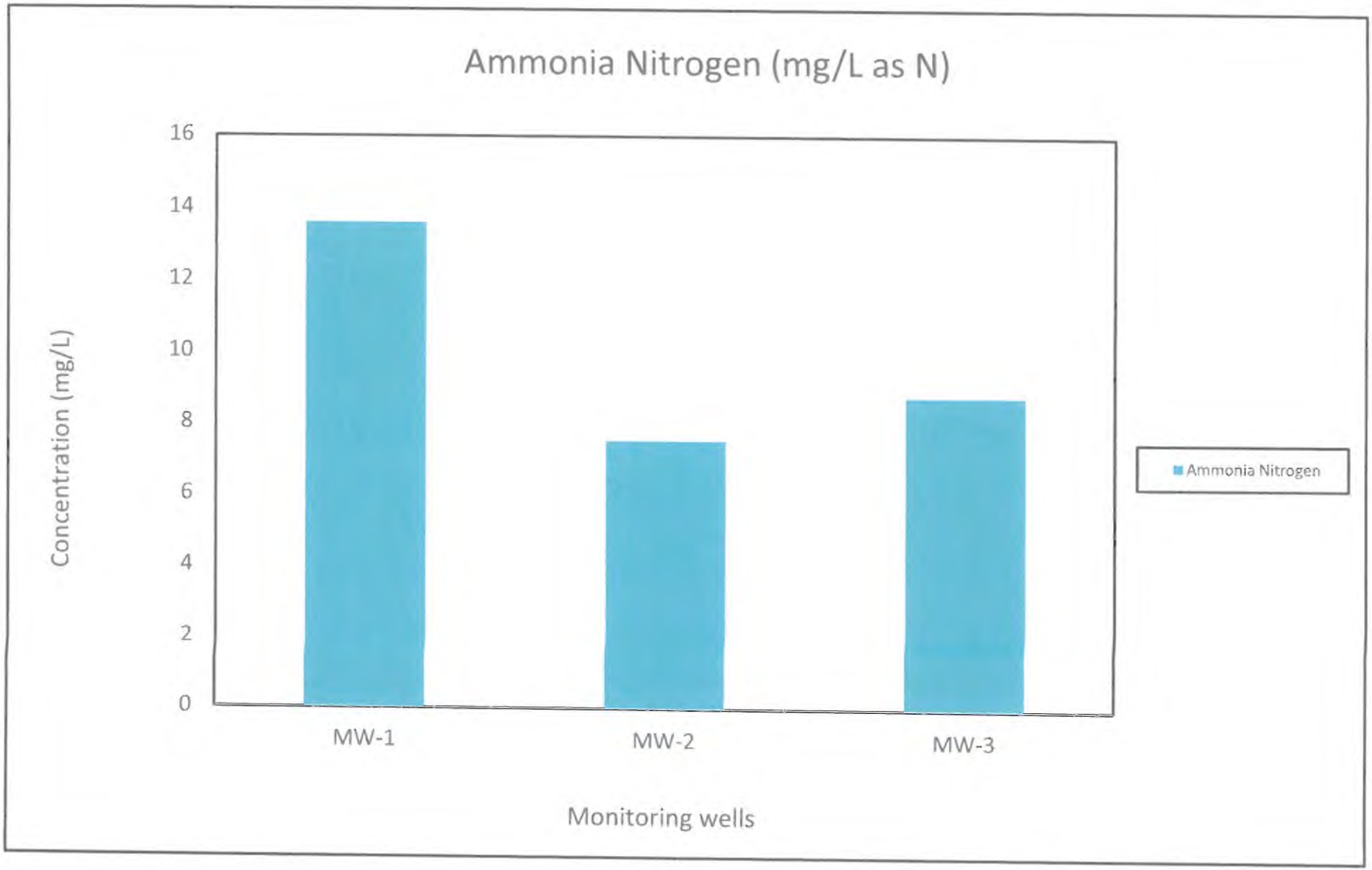
Reporting Limit: A data value set by the laboratory based on the CDL and CQL. Any value at or above the CQL requires no qualification. Any reported values required by the client from an analysis that shows a non-detect at the CDL is flagged with a "U" qualifier. Any reported value required by the client when an analyte is detected between the CDL and CQL is flagged with a "J" that reports the result as an estimated value.

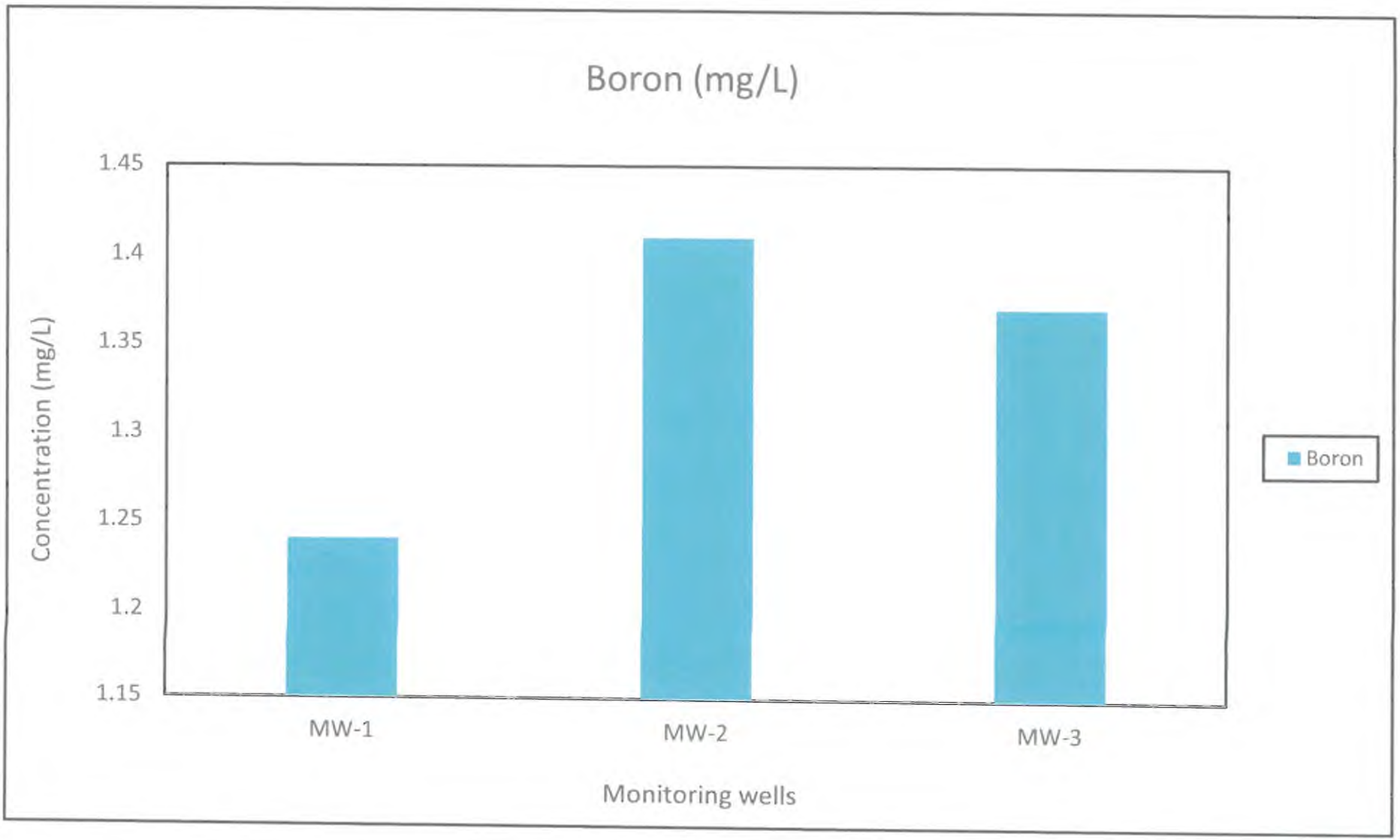
Sample: A portion for analysis in a single or multiple containers with a composition known to the submitter and identified by lab number to the analyst.

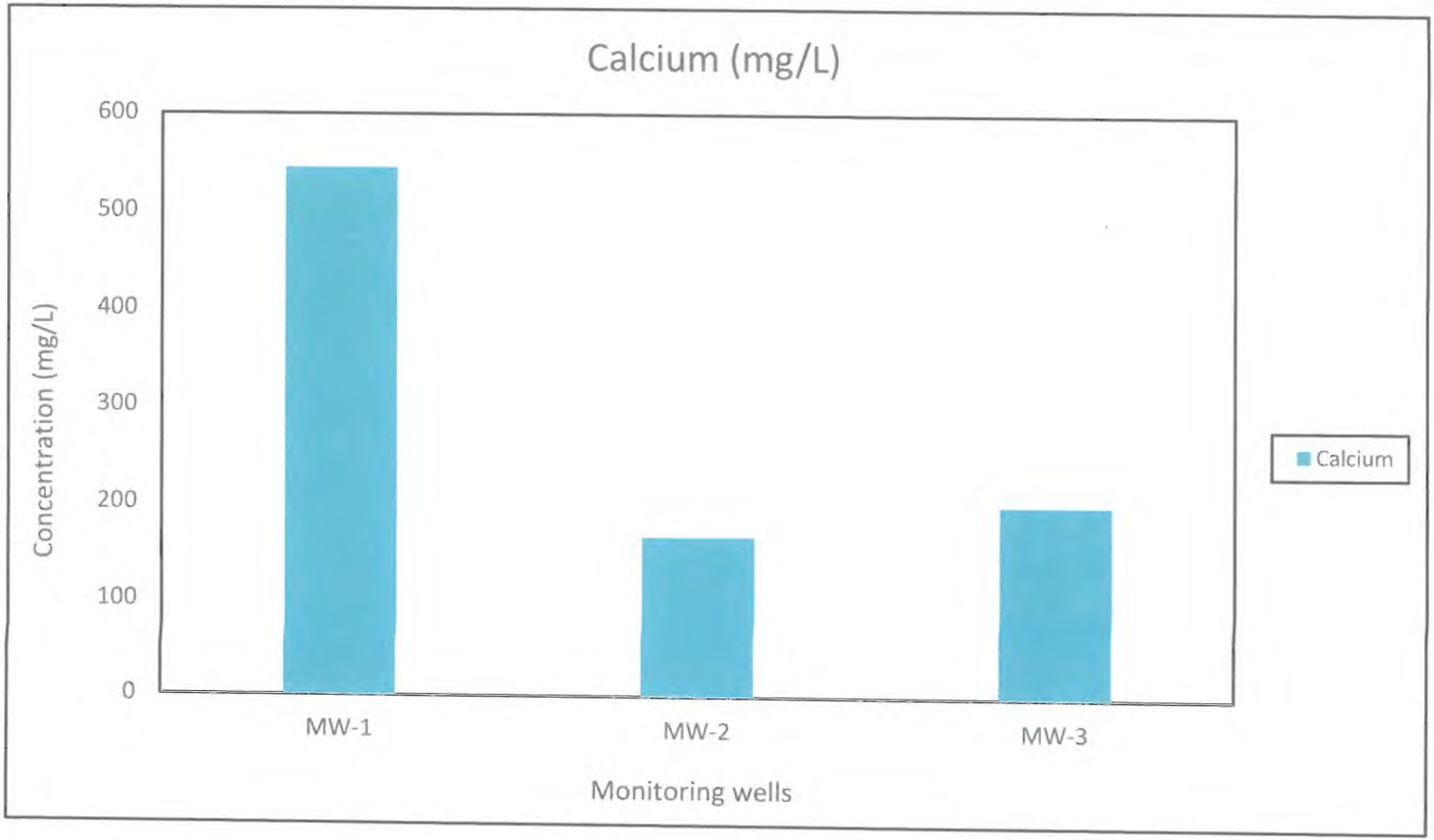
Surrogates: Compounds added to the sample before preparation, then measured after analysis to detect problems in the sample preparation procedure.

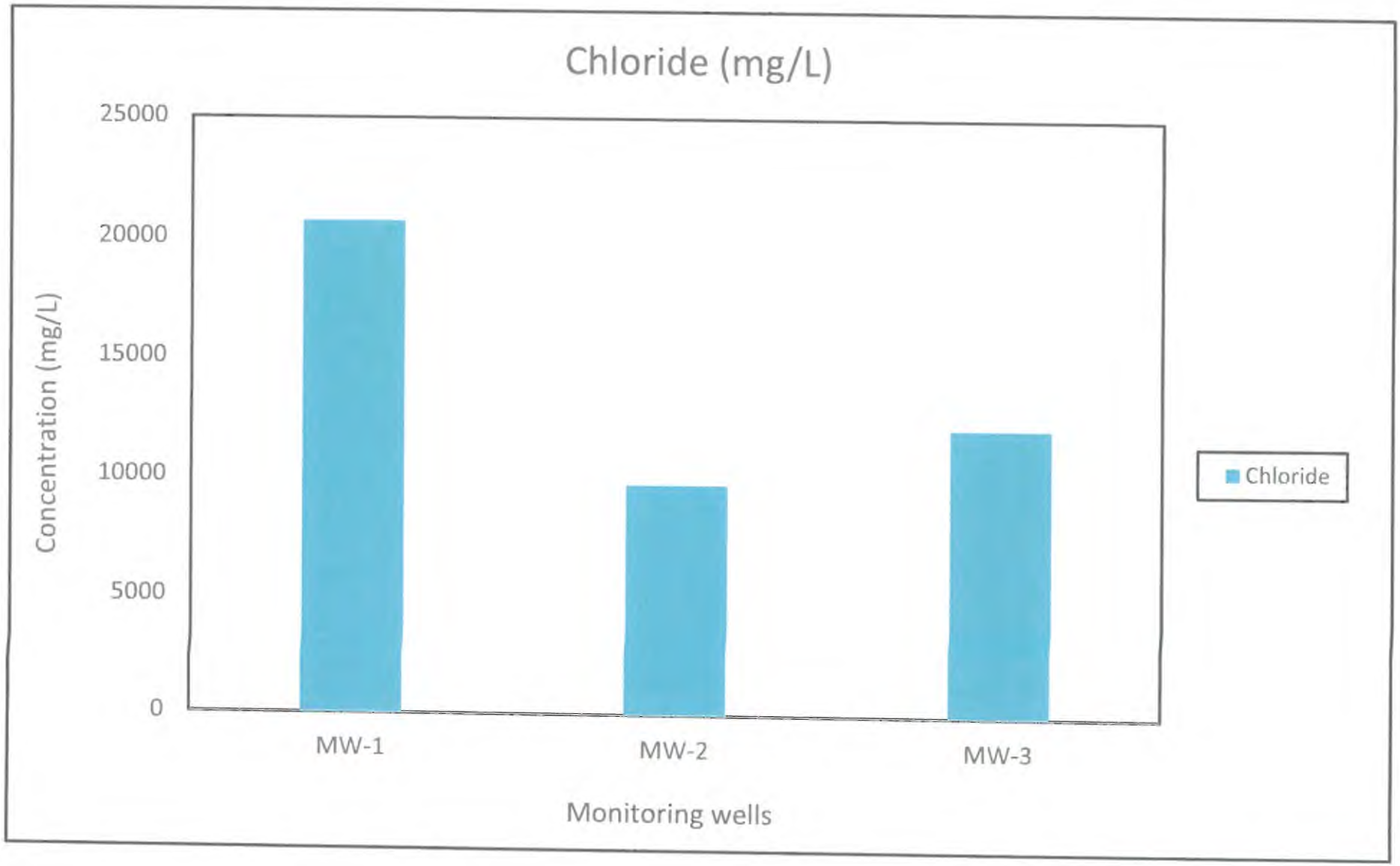
APPENDIX E

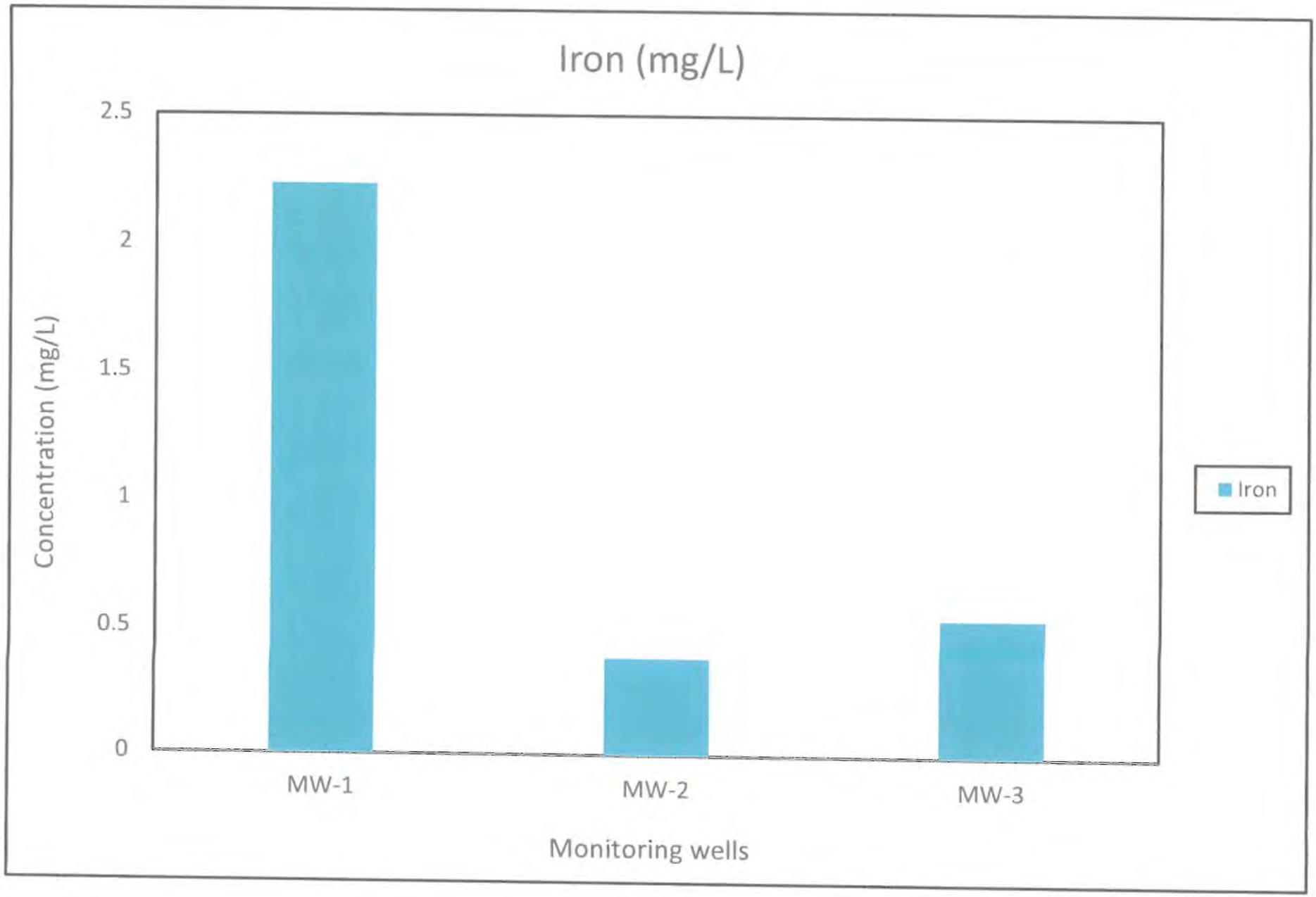
CONSTITUENT BAR CHARTS

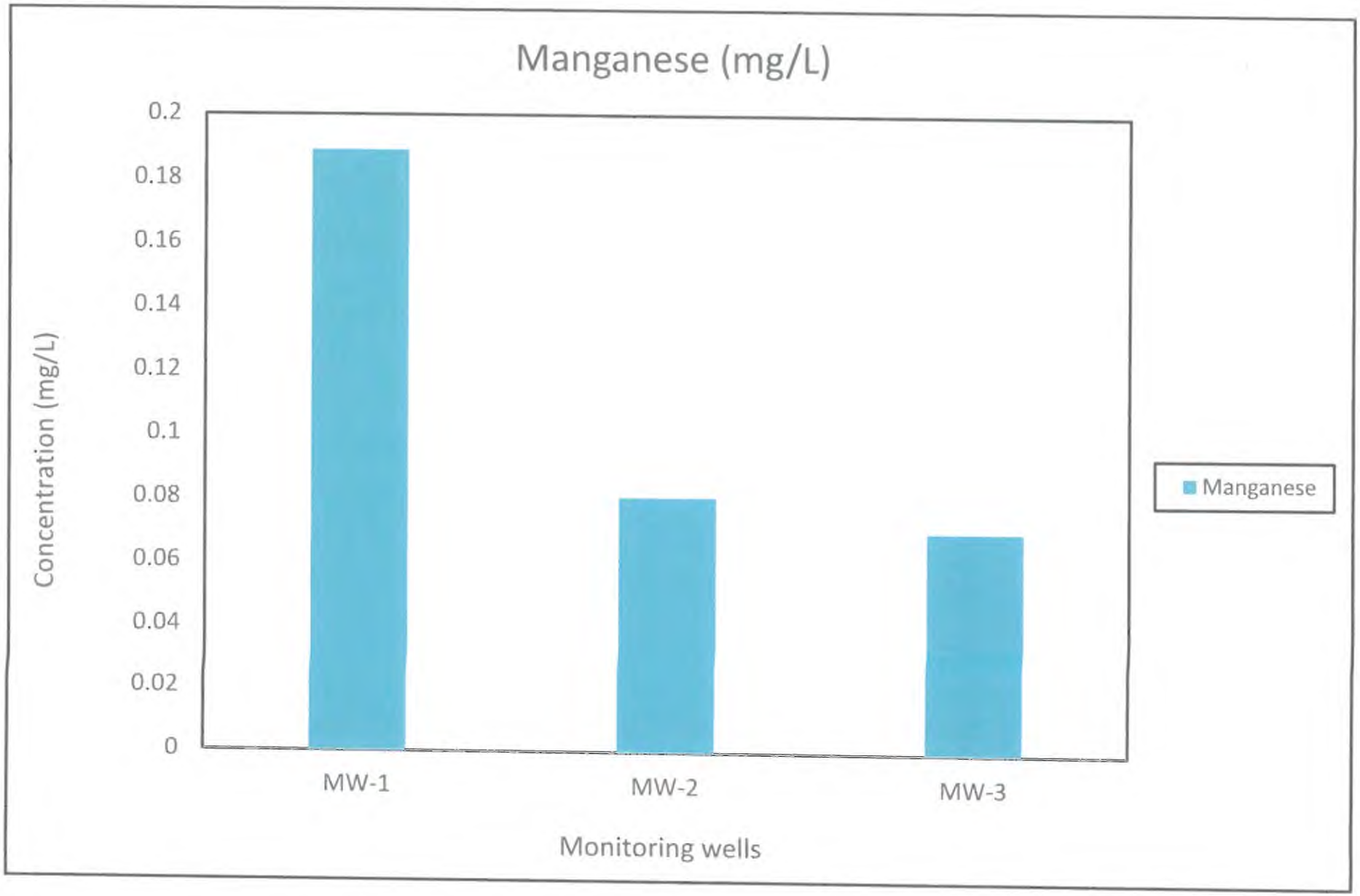

Ammonia Nitrogen (mg/L as N)
16
14
12
10
8
6
4
2
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Ammonia Nitrogen

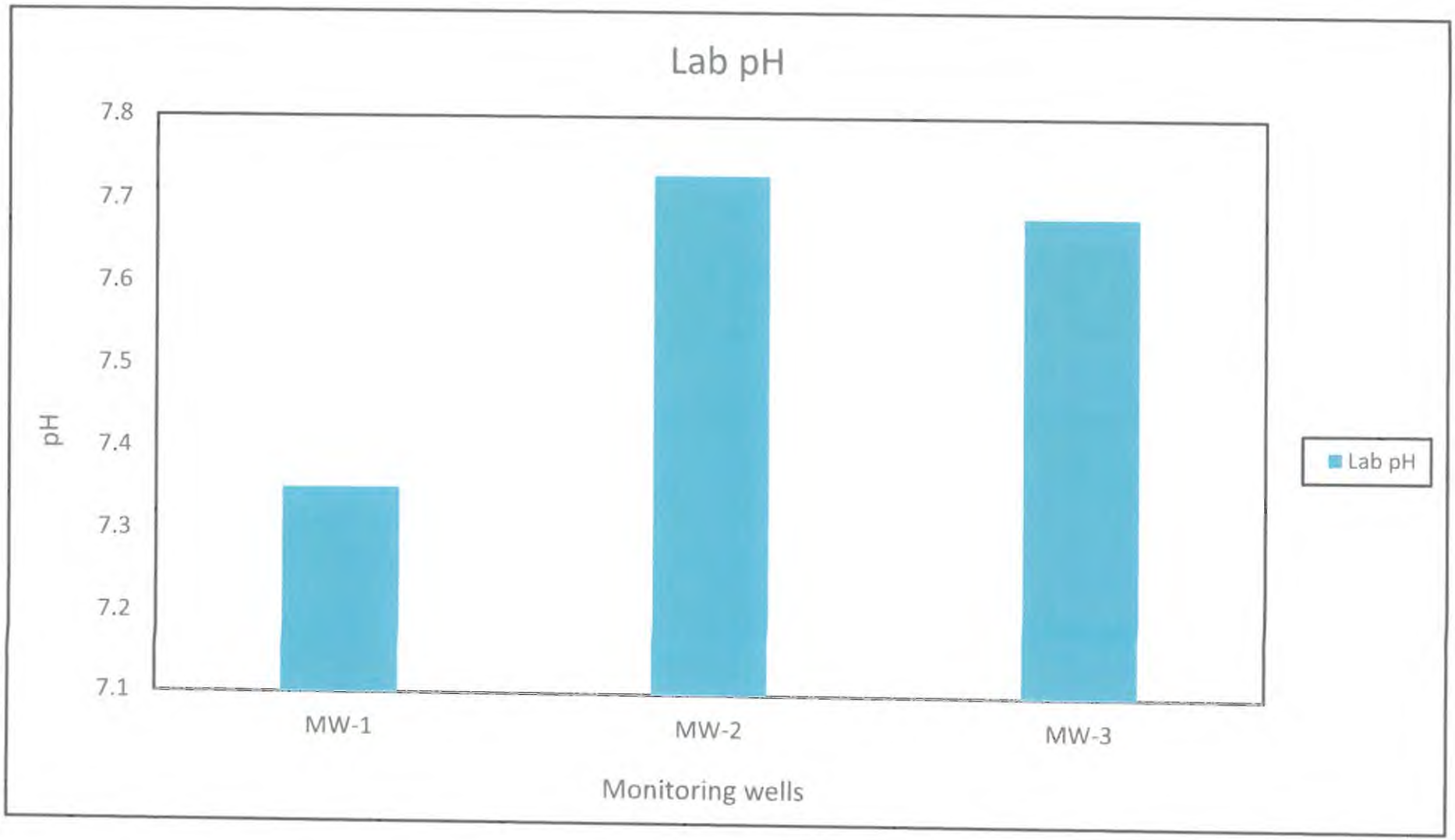

Boron (mg/L)
1.45
1.4
1.35
1.3
1.25
1.2
1.15
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Boron

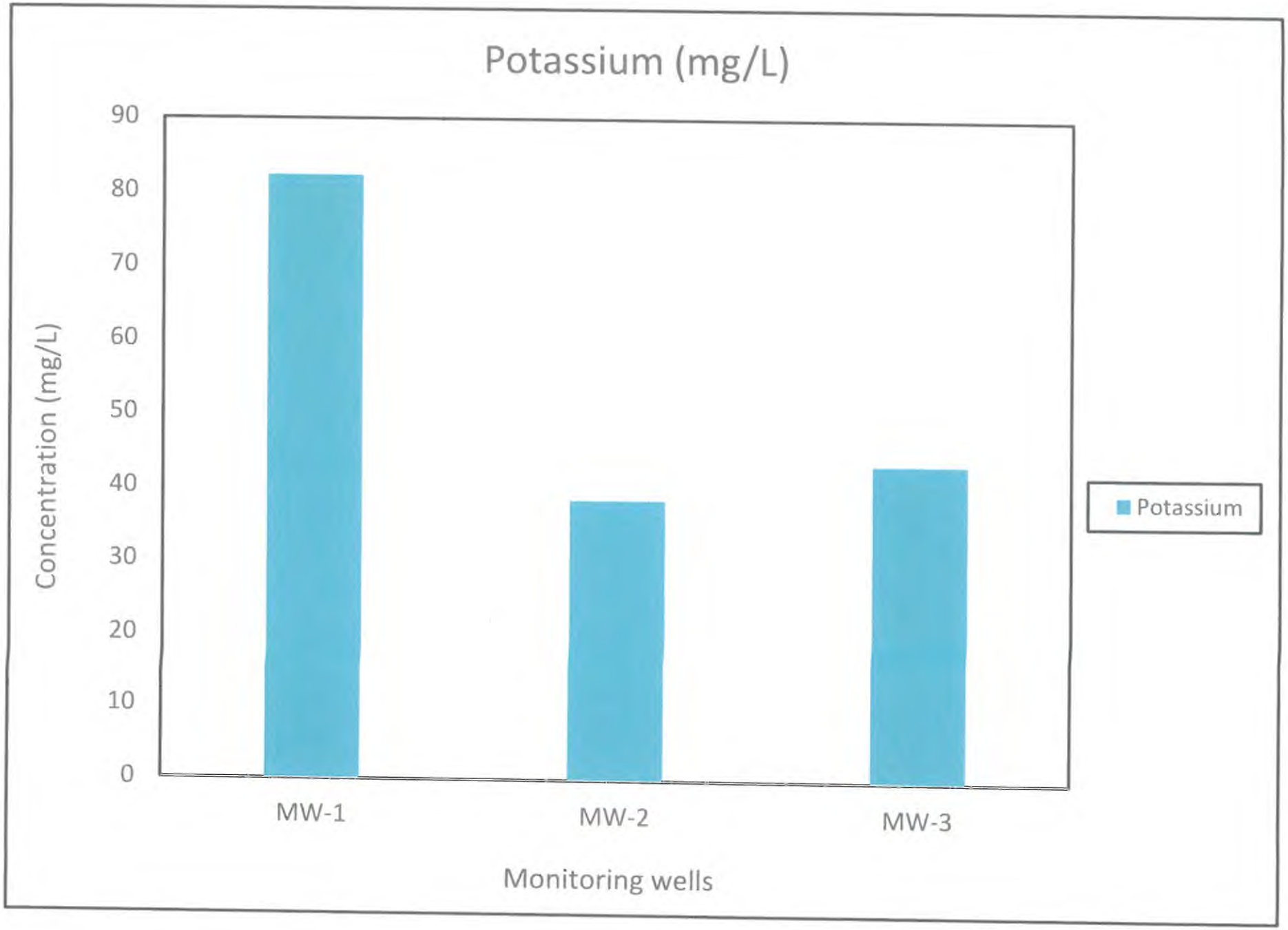

Calcium (mg/L)
600
500
400
300
200
100
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Calcium

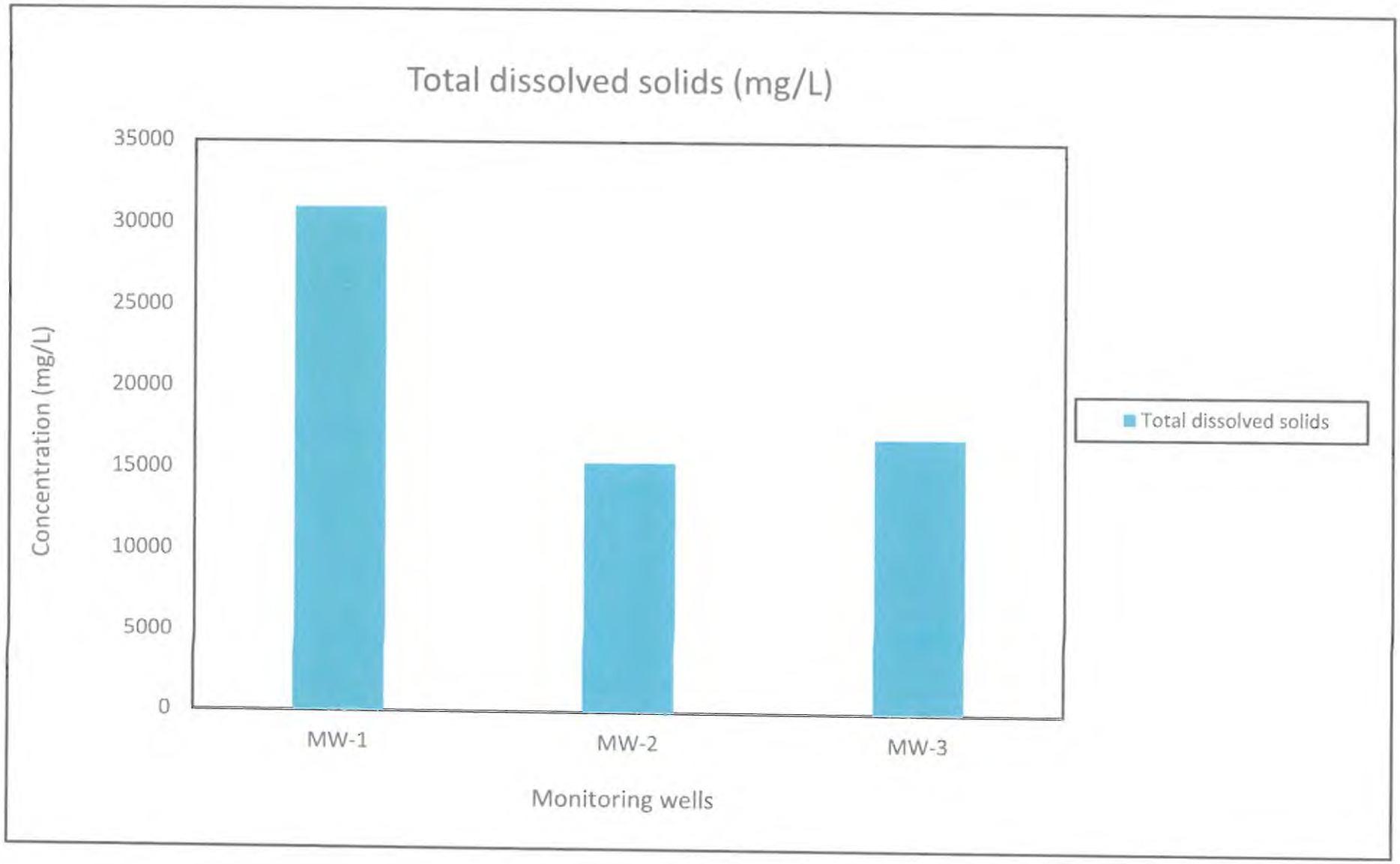

Chloride (mg/L)
25000
20000
15000
10000
5000
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Chloride

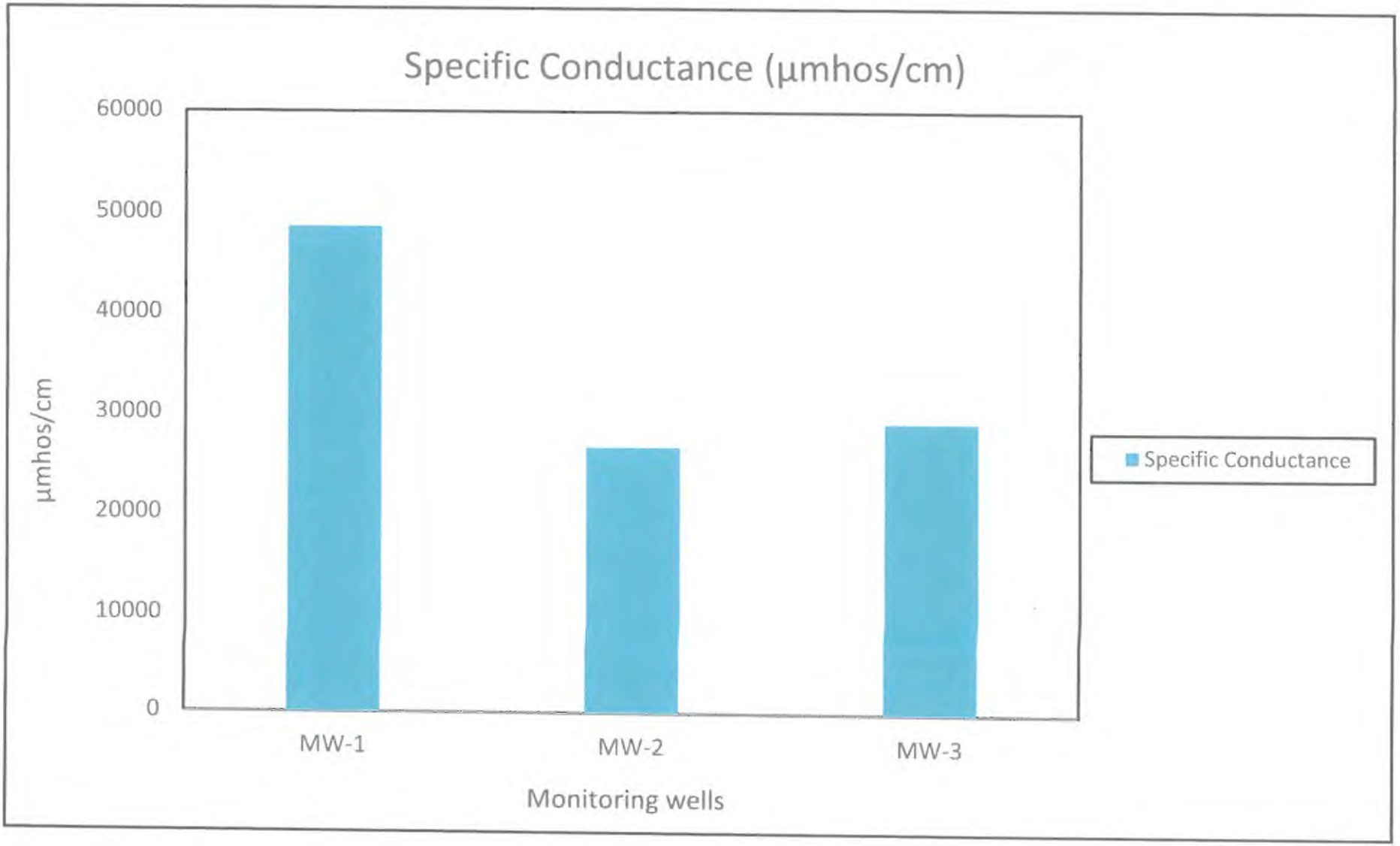

Iron (mg/L)
2.5
2
1.5
1
0.5
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Iron


Manganese (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Manganese


Lab pH
7.8
7.7
7.6
7.5
7.4
7.3
7.2
7.1
pH
MW-1
MW-2
MW-3
Monitoring wells
Lab pH


Potassium (mg/L)
90
80
70
60
50
40
30
20
10
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Potassium


Total dissolved solids (mg/L)
35000
30000
25000
20000
15000
10000
5000
0
Concentration (mg/L)
MW-1
MW-2
MW-3
Monitoring wells
Total dissolved solids


Specific Conductance (µmhos/cm)
60000
50000
40000
30000
20000
10000
0
µmhos/cm
MW-1
MW-2
MW-3
Monitoring wells
Specific Conductance