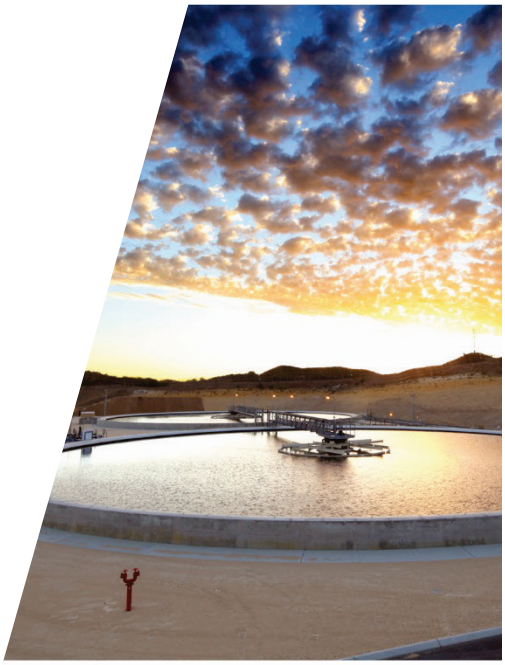

Annual Groundwater Monitoring Report

Bemis Company, Inc.
Des Moines, Iowa
EPA ID IAD001818327

Bemis Company, Inc.

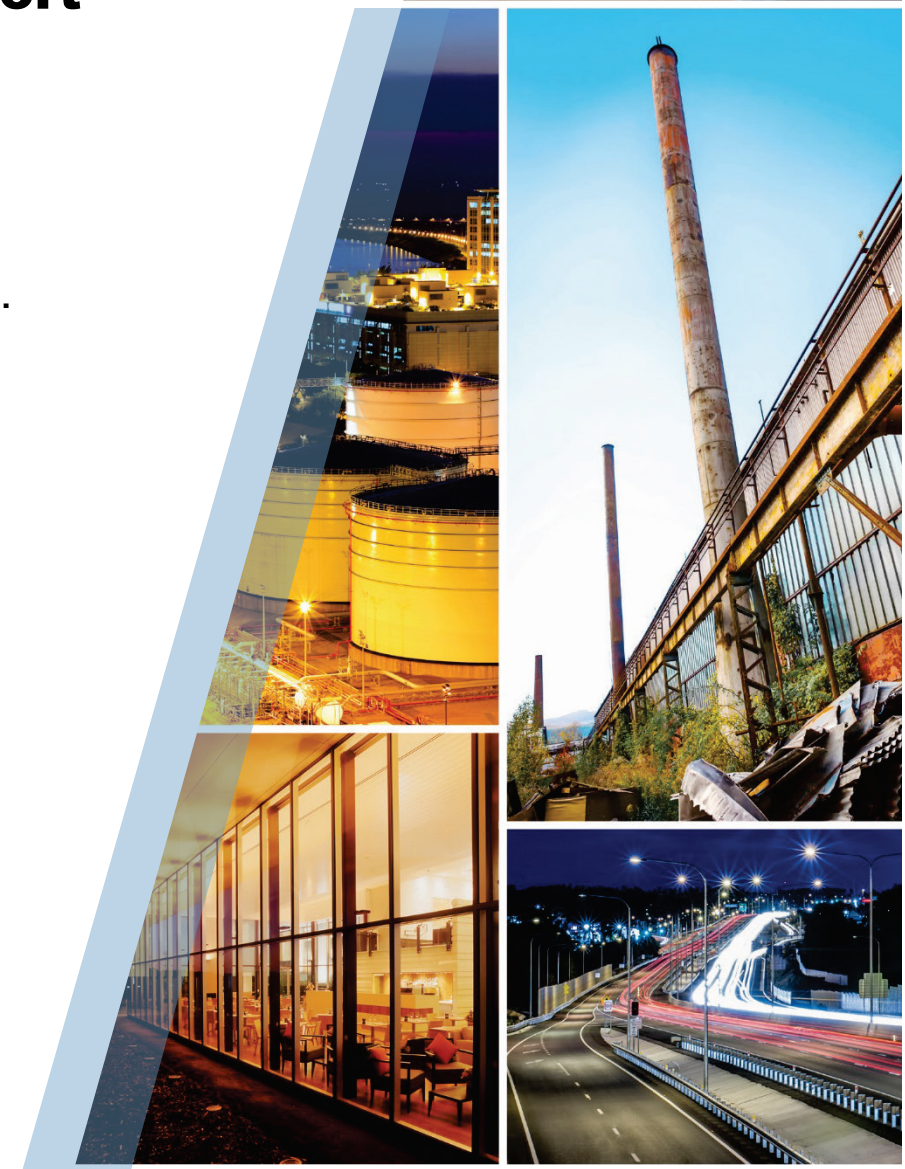

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Figure 1 Inferred Direction of Groundwater Flow – September 10, 2018

Figure 2 Inferred Direction of Groundwater Flow – March 14, 2019

Table Index

Table 1 Summary of Groundwater Elevation Data

Table 2 Monitoring Well Screen Occlusion Evaluation

Table 3 Duplicate Sample Results Summary

Table 4 Total Arsenic in Groundwater

Table 5 95-Percent UCL Summary for Groundwater

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Appendix A Photographic Log

Appendix B Groundwater Sample Collection Records

Appendix C Laboratory Analytical Reports

Appendix D Statistical Evaluation Outputs

1. Introduction

On behalf of Bemis Company, Inc. (Bemis), GHD has prepared this Annual Groundwater Monitoring Report for the United States Environmental Protection Agency, Region VII (USEPA) to summarize the groundwater monitoring activities at the Bemis facility located at 1500 East Aurora Avenue in Des Moines, Iowa. Semiannual groundwater monitoring activities addressed in this report were completed in September 2018 and March 2019.

The September 2018 and March 2019 monitoring events were conducted in accordance with the June 3, 2016 Groundwater Monitoring Plan (GMP) outline, as approved by the USEPA in the Letter of Agreement for Corrective Action Work dated September 1, 2016. Groundwater sampling methods and quality assurance/quality control activities were completed in accordance with the April 2013 Groundwater Sampling Quality Assurance Project Plan (QAPP).

The sampling events completed in September 2018 and March 2019 are the 7th and 8th rounds of sampling described in the GMP. Statistical tests were used to evaluate compliance with the monitoring objectives identified in the GMP. The statistical evaluation for total arsenic at each perimeter and source area well have been completed using the data collected as part of this monitoring program plus the 2013/2014 data (excluding duplicate sample results).

2. Groundwater Monitoring Activities

Semiannual groundwater monitoring was completed during the weeks of September 10, 2018 and March 14, 2019.

2.1 Monitoring Well Inspection

The site monitoring wells were inspected during both semiannual monitoring events and found to be in generally good condition during both events. Minor sediment accumulation deposited on the monitoring well pads was removed as part of the inspections. Photographs of the monitoring wells were taken prior to the September 2018 monitoring event and are provided in the attached photo log (Appendix A).

2.2 Monitoring Well Gauging

GHD personnel opened and gauged monitoring wells in the general order of least impacted to most impacted for both monitoring events, using a Solinst Water Level Meter Model 101 to measure the depth-to-water from the survey mark at the top-of-casing of each monitoring well on the gauging list. The total depth of each well identified for sample collection was measured during the September 2018 event using a weighted steel tape. Total depth measurements were taken immediately following depth-to-water measurements. The water level elevation and total well depth measurement data are provided in Tables 1 and 2, respectively.

The wells were gauged generally from high arsenic concentration to low arsenic concentration during each gauging event. The wells were gauged in the following order for the September 2018 sampling event: MW-19A, MW-16A, MW-17A, MW-14A, MW-20A, MW-10A, MD-5, MW-3, and MW-8A. The wells were gauged in the following order for the March 2019 sampling event: MW-16A, MW-17A, MW-20A, MW-10A, MD-5, MW-14A, MW-3, MW-8A, and MW-19A. Equipment was decontaminated and new nitrile gloves were donned by field personnel at each location.

Total well depth measurement and screen occlusion calculations from the semiannual monitoring events are presented in Table 2. In September 2018, all monitoring wells were below the 25-percent occlusion criteria with a maximum occlusion at 4.3 percent for MD-5 during the September 2018 sampling event. The September 2018 total depth measurements were consistent with March 2018 total depth measurements with the exception of MW-20A, which had a -20.8 percent screen occlusion calculation based on measurements. This is likely due to a measurement error. The total depth of MW-20A will be verified during the September 2019 monitoring event.

2.3 Groundwater Sampling Activities

In accordance with the GMP, the September 2018 and March 2019 sampling was completed using QED Sample Pro® pneumatic bladder pumps with disposable bladders. One of the monitoring wells (MW-14A) is partially obstructed, preventing insertion of the bladder pump. As a result, MW-14A was sampled using a peristaltic pump. No repairs to MW-14A appear to be warranted based on the inspection. It appears there is a constriction or deflection in the casing, preventing insertion of the pump, but the casing does not appear to be broken.

Wells were sampled generally from least impacted to most impacted, based on historic sample data. During both sampling events, the wells were sampled using QED Sample Pro® bladder pumps identified by serial numbers [SN] 14113 and 14112. During the September 2018 sampling event, the bladder pump identified by SN 14113 was used to sample MW-16A and MW-17, in that order. The bladder pump identified by SN 14112 was used to sample MW-20A, MW-10A, MD-5, and MW-3, in that order; MW-14A was sampled using a peristaltic pump with dedicated tubing.

During the March 2019 sampling event, the bladder pump identified by SN 14112 was used to sample MW-16A, MW-17A, and MW-3, in that order. The bladder pump identified by SN 14113 was used to sample MW-20A, MW-10A, and MD-5, in that order. Monitoring well MW-14A was sampled using a peristaltic pump with dedicated tubing.

During both sampling events, each pump was decontaminated prior to arrival on site and again after use at each monitoring well, using distilled water and Alconox® detergent followed by a distilled water rinse. The matrix spike and matrix spike duplicate samples were collected from MW-10A during both monitoring events. The equipment blank sample (EB-01) was collected from SN 14112 for the September 2018 and SN 14113 for the March 2019 sampling events, following decontamination activities after sampling at MW-20A and prior to use at MW-10A for the September 2018 and March 2019 monitoring events. The duplicate sample (DP-01) was collected from MW-3 using pump SN 14112 for both sampling events. Stabilization parameters (pH, specific conductance, temperature, oxidation-reduction potential, and dissolved oxygen) were measured using a HORIBA U-5200 multiparameter water quality instrument in September 2018, and an In-Situ smarTROLL™ multiparameter handheld water quality instrument was used in March 2019. A Hach®

2100P turbidimeter was used to measure turbidity during the purging of each monitoring well during both monitoring events. Stabilization parameters were recorded on Groundwater Sample Collection Records (Appendix B).

Purge volumes were measured using a graduated container. Purge water was containerized in a labeled 55-gallon drum staged in the waste storage area at the facility.

Following stabilization of the field parameters, unfiltered groundwater samples were collected in laboratory-preserved containers. Following collection, the samples were placed in an iced cooler and the samples were submitted to Keystone Laboratories, Inc. (Keystone) in Newton, Iowa for the laboratory analysis of total arsenic by Method 6020. Copies of the final laboratory analytical reports are provided in Appendix C.

3. Summary of Groundwater Monitoring Results

3.1 Groundwater Flow Direction

Groundwater elevations were calculated based on the depth-to-water measurements and top-of-casing elevations (Table 1). In the southwest area of the site, groundwater flow was generally to the south-southeast for the September 2018 monitoring event, and to the south during the March 2019 monitoring event. In the northeast area of the site, groundwater flow was generally to the north-northeast during the September 2018 monitoring event, and to the northeast during the March 2019 monitoring event. These flow directions are consistent with the predominant flow direction observed in previous years. The inferred direction of groundwater flow during the September 2018 and March 2019 monitoring events are illustrated on Figure 1 and Figure 2, respectively.

3.2 Quality Assurance

Based on the evaluated data completeness, representativeness, accuracy, precision, comparability, sensitivity, and traceability, the September 2018 and March 2019 groundwater sample data are considered usable. For both monitoring events, the relative percent difference between the duplicate samples and the corresponding monitoring well samples met the acceptance criteria (Table 3). The equipment blanks collected during the two semiannual monitoring events were both non-detect for total arsenic.

3.3 Total Arsenic Results

In accordance with the GMP, total arsenic was analyzed at each of the seven sampled monitoring wells (MW-14A, MW-16A, and MW-17A in the southwest area; MD-5, MW-3, MW-10A, and MW-20A in the northeast area). Total arsenic data for the two recent semiannual groundwater monitoring events and total arsenic data collected during 2013 and 2014 are provided in Table 4. Eight rounds of total arsenic data are available (excluding duplicates) for two of the northeast area wells (MW-3 and MW-10A); the remaining wells in the northeast and southwest area have from six to seven samples (excluding duplicates). Statistical evaluation, as described in the GMP, has been completed for MW-3 and MW-10A. The arsenic data collected to date is provided in Table 4.

During the September 2018 and March 2019 monitoring events, total arsenic was detected above the drinking water Maximum Contaminant Level (MCL) during both monitoring events in the source area wells (MW-3 and MW-14A). The maximum total arsenic concentrations were detected in northeast source area well MW-3 and in the associated duplicate sample during the September 2018 monitoring event and in southwest source area well MW-14A during the March 2019 monitoring event. Total arsenic was detected above the MCL during both monitoring events at perimeter monitoring well MW-10A. Total arsenic was detected in MD-5 but was below the MCL. All other monitoring wells (MW-20A, MW-16A, and MW-17A) were non-detect for total arsenic during both monitoring events.

3.4 Evaluation of Arsenic Compliance

USEPA software ProUCL (Version 5.1) was used to characterize the monitoring well dataset (e.g., data distribution, variability, number of data points, number of data points below the Method Detection Limit [MDL], number of tied data values); and to calculate the appropriate 95-percent UCL of the true mean concentration for arsenic. By definition, the 95-percent UCL of the true mean concentration of arsenic at a monitoring well is a value that, when calculated repeatedly for randomly drawn datasets, equals or exceeds the true mean concentration of arsenic, 95 percent of the time (USEPA, 1992). The calculated 95-percent UCLs were compared to the arsenic MCL at each well, as outlined in accordance with the June 3, 2016 GMP outline, as approved by the USEPA in the Letter of Agreement for Corrective Action Work dated September 1, 2016 and summarized in Table 5.

Arsenic is determined to be compliant at a well if the 95-percent UCL of the true mean concentration is equal to or less than the MCL. If arsenic compliance is not demonstrated through this statistical hypothesis test, additional statistical hypothesis tests will be conducted through an iterative process after collection of subsequent groundwater samples until arsenic compliance is demonstrated.

A 95-percent UCL cannot be reliably calculated with fewer than eight samples, so the 95-percent UCL has only been calculated for source area wells MW-3 and MW-20A in this annual report. The entire monitoring network will have a minimum of eight samples for evaluation at the time of the annual report due in 2020.

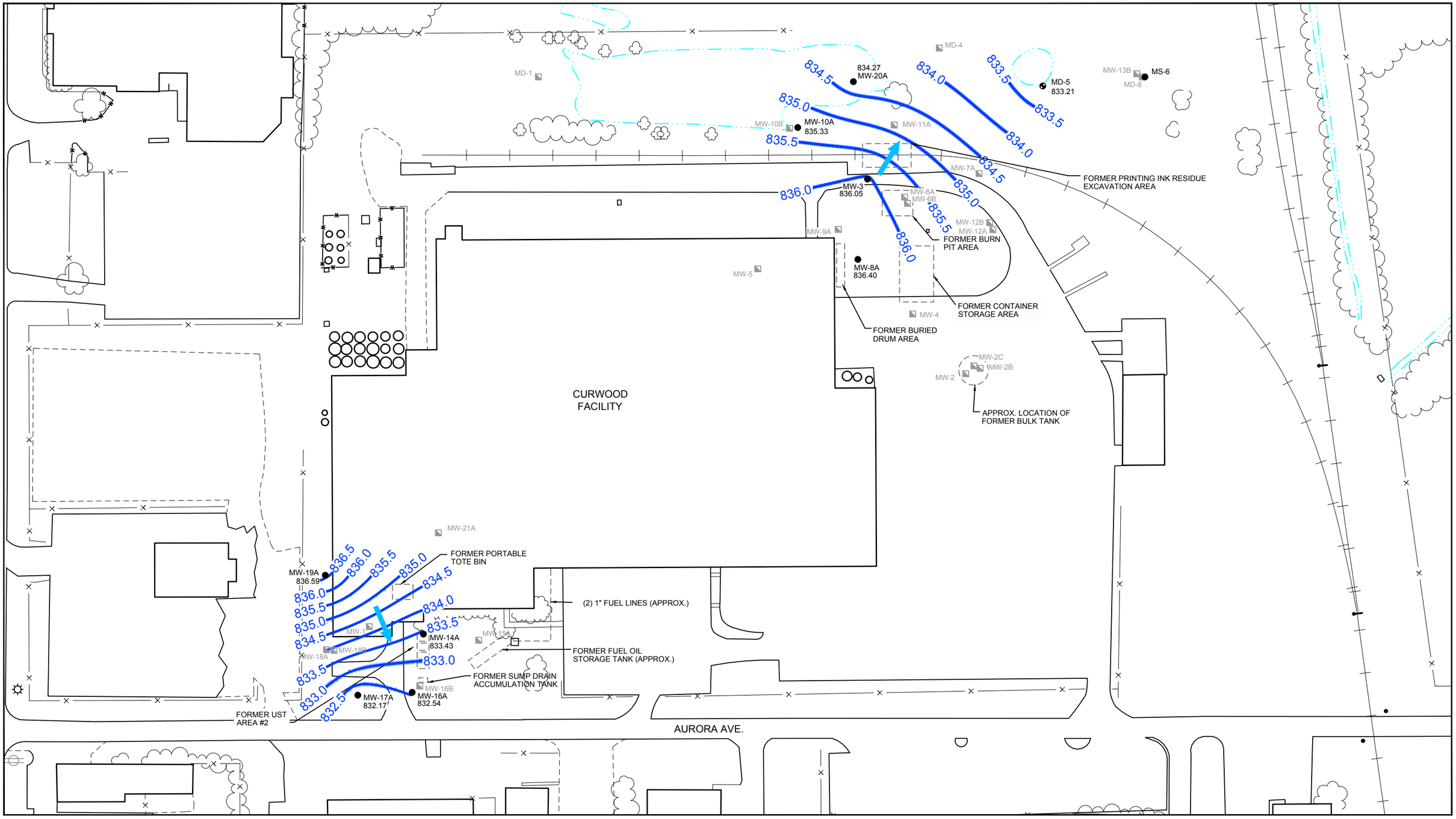
3.4.1 Comparison of 95-Percent UCL Concentrations to Cleanup Levels

Source area wells MW-3 and MW-20A have a 95-percent UCL value exceeding the MCL, as shown in Table 5. Perimeter compliance wells MW-16A, MW-17A, and MW-20 have been non-detect for arsenic over the course of the monitoring period and are compliant with the MCL.

4. Future Activities

The next semiannual groundwater monitoring event is scheduled for September 2019. The next annual groundwater monitoring report will be prepared following receipt of the data from the spring 2020 sampling event. Due to source wells and perimeter wells having an arsenic 95-percent UCL exceeding the arsenic MCL, statistical testing will be performed annually and included in future Annual Groundwater Monitoring Reports until the 95-percent UCL is below the MCL, as outlined in the GMP.

Figures



Source: MWH, Des Moines, Iowa - Figure 2, Site Layout and Monitoring Well Network

0 50 100ft

Coordinate System:
NAD83 STATE PLANE
IOWA NORTH

LEGEND:

- EXISTING MONITORING WELL
- MONITORING WELL (DECOMMISSIONED / UNABLE TO LOCATE)
- HAMILTON DRAINAGE PROJECT WELL
- INTERMITTENT POND OR STREAM
- 832 — GROUNDWATER CONTOUR (ft. AMSL) (SEPTEMBER 20, 2017)
- 840.54 — GROUNDWATER ELEVATION MEASURED ON SEPTEMBER 20, 2017 (ft. AMSL)
- INFERRED DIRECTION OF GROUNDWATER FLOW

BEMIS COMPANY, INC.
CURWOOD, INC. FACILITY
DES MOINES, IOWA

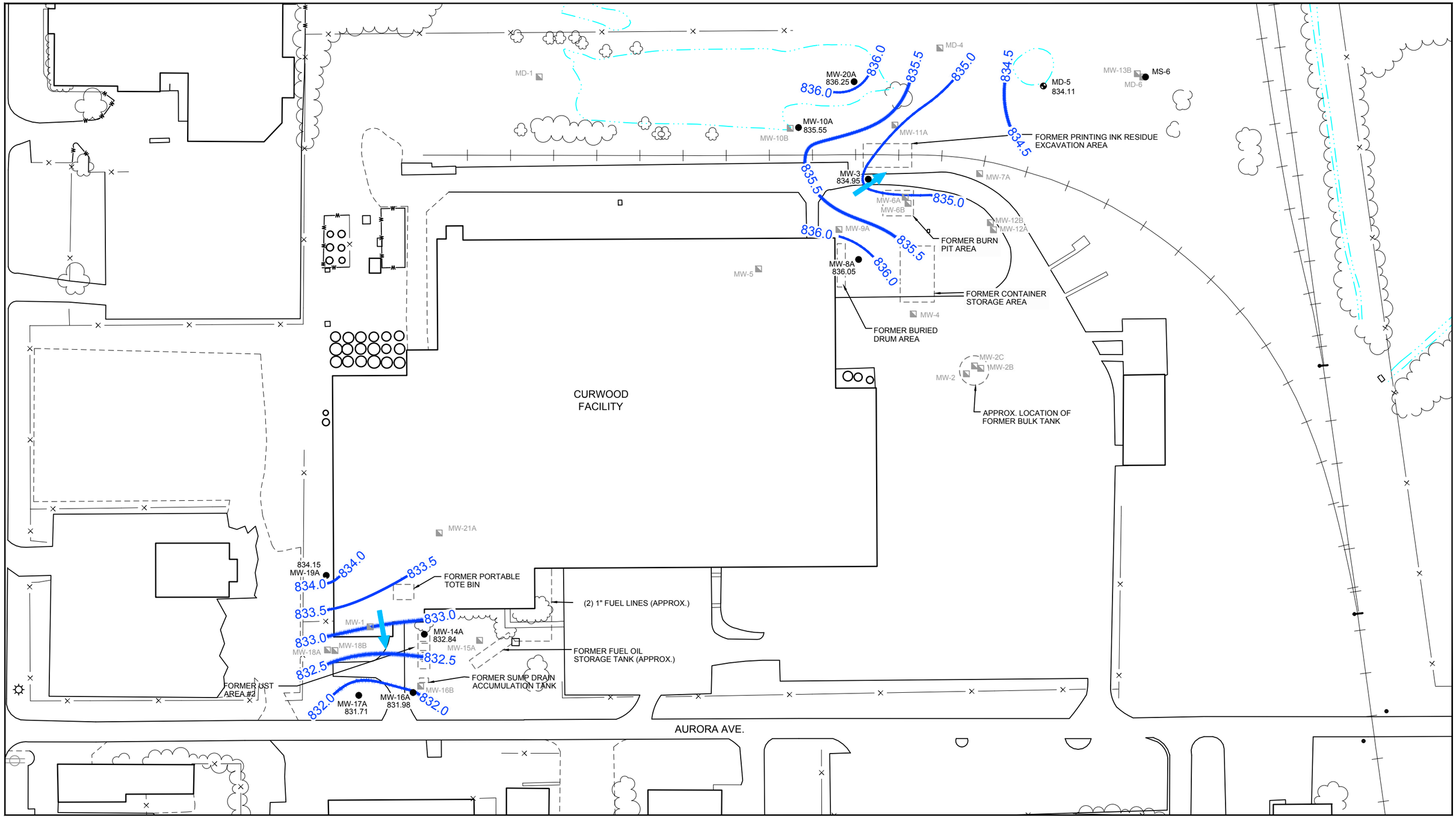
INFERRED DIRECTION OF GROUNDWATER FLOW - SEPTEMBER 10, 2018

11111346-004

Apr 8, 2019

FIGURE 1

CAD File: P:\drawings\11111000s\11111346\11111346-REPORTS\11111346-004(003)\11111346-004(003)GN\11111346-004(003)GN-WA001.dwg



Source: MWH, Des Moines, Iowa - Figure 2, Site Layout and Monitoring Well Network

0 50 100ft

Coordinate System:
NAD83 STATE PLANE
IOWA NORTH

LEGEND:

- EXISTING MONITORING WELL
- MONITORING WELL (DECOMMISSIONED / UNABLE TO LOCATE)
- HAMILTON DRAINAGE PROJECT WELL
- INTERMITTENT POND OR STREAM
- 826 — GROUNDWATER CONTOUR (ft. AMSL) (MARCH 19, 2018)
- 826.32 — GROUNDWATER ELEVATION MEASURED ON MARCH 19, 2018 (ft. AMSL)
- INFERRED DIRECTION OF GROUNDWATER FLOW

BEMIS COMPANY, INC.
CURWOOD, INC. FACILITY
DES MOINES, IOWA

INFERRED DIRECTION OF GROUNDWATER FLOW - MARCH 14, 2019

11111346-004

Apr 8, 2019

FIGURE 2

CAD File: P:\drawings\11111000s\11111346\11111346-REPORTS\11111346-004(003)\11111346-004(003)GN\11111346-004(003)GN-WA002.dwg

Tables

Table 1

Summary of Groundwater Elevation Data
Bemis Company, Inc. - Des Moines, Iowa
IAD001818327

Well	Top of Casing Elevation	19-Sep-2016	7-Mar-2017	20-Sep-2017	19-Mar-2018	10-Sep-2018	14-Mar-2019
Northeast Area Wells							
MD-5	838.13	832.28	832.17	828.20	832.38	833.21	834.11
MW-3	841.87	833.63	833.74	832.90	834.11	836.05	834.95
MW-8A	840.70	835.75	834.39	833.88	834.08	836.40	836.05
MW-10A	839.48	833.98	833.79	831.96	834.29	835.33	835.55
MW-20A	838.93	832.55	832.92	829.88	833.87	834.27	836.25
Southwest Area Wells							
MW-14A	840.54	832.77	831.68	831.98	831.63	833.43	832.84
MW-16A	837.73	831.85	831.61	830.11	830.85	832.54	831.98
MW-17A	837.67	831.25	830.38	830.54	830.64	832.17	831.71
MW-19A	841.65	834.91	832.50	833.37	833.13	836.59	834.15

Notes:
Elevations in feet above sea level.

Table 2

Monitoring Well Screen Occlusion Evaluation
Bemis Company, Inc. - Des Moines, Iowa
IAD001818327

Well	Top of Casing Elevation	Total Well Depth Below Top of Casing (feet)	Screen Length (feet)	20-Sep-2017 Measured Well Depth (feet)	20-Sep-2017 Percent Screen Occluded	19-Mar-2018 Measured Well Depth (feet)	19-Mar-2018 Percent Screen Occluded	10-Sep-2018 Measured Well Depth (feet)	10-Sep-2018 Percent Screen Occluded
Northeast Area Wells									
MD-5	838.13	25.43	10	25.03	4.0%	24.97	4.6%	25.00	4.3%
MW-3	841.87	17.24	10	17.01	2.3%	16.98	2.6%	17.05	1.9%
MW-8A	840.70	17.28	10	17.22	0.6%	17.16	1.2%	18.27	-9.9%
MW-10A	839.48	20.14	10	20.27	-1.3%	20.07	0.7%	20.26	-1.2%
MW-20A	838.93	19.96	10	19.96	0.0%	19.82	1.4%	22.04	-20.8%
Southwest Area Wells									
MW-14A	840.54	18.22	10	18.10	1.2%	18.04	1.8%	18.11	1.1%
MW-16A	837.73	17.81	10	17.22	5.9%	17.62	1.9%	17.77	0.4%
MW-17A	837.67	18.38	10	18.34	0.4%	18.11	2.7%	18.70	-3.2%
MW-19A	841.65	18.79	10	18.75	0.4%	18.51	2.8%	18.73	0.6%

Notes:
Elevations in feet above sea level.
% - Percent.

Table 3

Duplicate Sample Results Summary
Bemis Company, Inc. - Des Moines, Iowa
IAD001818327

	Drinking Water MCL	Units	MW-3 09/11/2018	DP-01 09/11/2018	RPD	MW-3A 03/14/2019	DP-01 03/14/2019	RPD
Arsenic, Total	0.01	mg/L	0.174	0.175	1%	0.131	0.142	8%

Notes:
mg/L - Milligram(s) per liter.
EPA - United States Environmental Protection Agency.
RPD - Relative Percent Difference.
% - Percent

Table 4

Total Arsenic in Groundwater
Bemis Company, Inc. - Des Moines, Iowa
IAD001818327

Well and Location	Sample Date	Arsenic, Total (mg/L)
Drinking Water MCL for Arsenic		**0.010**
Northeast Area		
MW-3 (Source Area)	6/27/2013	**0.154**
	6/27/2013 (duplicate)	**0.159**
	10/28/2014	**0.217**
	9/21/2016	**0.196**
	9/21/2016 (duplicate)	**0.202**
	3/7/2017	**0.130**
	3/7/2017 (duplicate)	**0.134**
	9/21/2017	**0.171**
	9/21/2017 (duplicate)	**0.173**
	3/20/2018	**0.182**
	3/20/2018 (duplicate)	**0.165**
	9/11/2018	**0.174**
	9/11/2018 (duplicate)	**0.175**
	3/14/2019	**0.131**
	3/14/2019 (duplicate)	**0.142**
MD-5 (Perimeter)	6/27/2013	0.0089
	6/27/2013 (duplicate)	0.0086
	9/20/2016	0.0075
	3/8/2017	**0.0129**
	9/21/2017	**0.0108**
	3/19/2018	**0.0112**
	9/11/2018	0.0055
	3/15/2019	0.0075
MW-10A (Perimeter)	6/27/2013	0.0082
	10/29/2014	**0.0304**
	9/20/2016	**0.0481**
	3/8/2017	**0.0206**
	9/20/2017	**0.0370**
	3/19/2018	**0.0206**
	9/11/2018	**0.0306**
	3/15/2019	**0.0263**
MW-20A (Perimeter)	9/20/2016	0.004 U
	3/8/2017	0.004 U
	9/20/2017	0.004 U
	3/19/2018	0.004 U
	9/11/2018	0.004 U
	3/15/2019	0.004 U

Table 4

Total Arsenic in Groundwater
Bemis Company, Inc. - Des Moines, Iowa
IAD001818327

Well and Location	Sample Date	Arsenic, Total (mg/L)
Drinking Water MCL for Arsenic		**0.010**
Southwest Area		
MW-14A (Source Area)	10/28/2014	**0.164**
	10/28/2014 (duplicate)	**0.163**
	9/21/2016	**0.187**
	3/7/2017	**0.124**
	9/21/2017	**0.220**
	3/20/2018	**0.132**
	9/11/2018	**0.129**
	3/15/2019	**0.139**
MW-16A (Perimeter)	6/26/2013	0.004 U
	9/19/2016	0.004 U
	3/7/2017	0.004 U
	9/20/2017	0.004 U
	3/19/2018	0.004 U
	9/11/2018	0.004 U
	3/14/2019	0.004 U
MW-17A (Perimeter)	6/25/2013	0.004 U
	9/20/2016	0.004 U
	3/7/2017	0.004 U
	9/20/2017	0.004 U
	3/19/2018	0.004 U
	9/11/2018	0.004 U
	3/14/2019	0.004 U

Notes:
Bold values exceed the Maximum Contaminant Level (MCL).
mg/L - Milligram(s) per liter.
U - Constituent not detected at the indicated concentration.

Table 5

95-Percent UCL Summary for Groundwater
Bemis Company, Inc. - Des Moines, Iowa
IAD001818327

Well and Location	Arsenic, Total (mg/L)
Drinking Water MCL for Arsenic	**0.010**
Northeast Area	
MW-3 (Source Area)	0.190
MD-5 (Perimeter)	Fewer than 8 samples
MW-10A (Perimeter)	0.036
MW-20A (Perimeter)	<0.004
Southwest Area	
MW-14A (Source Area)	Fewer than 8 samples
MW-16A (Perimeter)	<0.004
MW-17A (Perimeter)	<0.004

Notes:
< - Less than.
All concentration units in miligrams per liter.
Statistical summary based on samples collected from June 2013 through March 2019.
UCL - 95 Percent Upper Confidence Limit.
mg/L - Milligrams per liter.

Appendices

Appendix A
Photographic Log

Photo 1 - View of Northeast Area monitoring well MW-3.

Photo 2 - View of Northeast Area monitoring well MD-5.

Site Photographs

Photo 3 - View of Northeast Area monitoring well MS-6.

Photo 4 - View of Northeast Area monitoring well MW-8A.

Site Photographs

Photo 5 - View of Northeast Area monitoring well MW-10A.

Photo 6 - View of Southwest Area monitoring well MW-14A.

Site Photographs

Photo 7 - View of Southwest Area monitoring well MW-16A.

Photo 8 - View of Southwest Area monitoring well MW-17A.

Site Photographs

Photo 9 - View of Southwest Area monitoring well MW-19A.

Photo 10 - View of Northeast Area monitoring well MW-20A.

Site Photographs

Photo 11 - Purge-water storage drums were filled and sampled.

Photo 12 - New labels placed on purge-water storage drums – 1 of 2.

Photo 13 - New labels placed on purge-water storage drums – 2 of 2.

Appendix B
Groundwater Sample Collection Records

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-16A

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/10/18

Weather Conditions: 78° F, Sunny

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 17.77 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 5.19 feet — Three Well Volumes 6.15 gallons

c. Length of Water Column 12.58 feet — One System Volume 338 mL

2. WELL PURGING DATA:

a. Purge Method Sample Pro MP-SPK-4C portable bladder pump (S/N= 14112/14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1020	5.19	Pre-install							
1433	5.13	Start							
1435	5.77	Full Cell	22.02	6.49	0.910	205	5.36	7.69	Clear
1438	6.06	1000	20.26	6.64	0.860	202	2.85	7.36	Clear
1441	6.18	2000	19.85	6.70	0.815	205	2.62	8.52	Clear
1444	6.18	3000	20.37	6.68	0.803	211	2.44	7.08	Clear
1447	6.18	3800	20.52	6.68	0.806	215	2.41	4.89	Clear
1450	6.18	4800	20.68	6.64	0.816	219	2.36	4.21	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-16A

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW16A-GW-0918 Time Sampled: 14:51

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (\text{h ft})(9.65\text{ mL/ft})$ = 113

One System Volume = 338 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 13 feet below TOC

QA/QC Sample Collected = None

10 @ 5 @ 15 PSI @ 1433

11 @ 4 @ 15 PSI @ 1443

Erik Day
Sampler (Signature)

Erik Day
(Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-17A

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/10/18

Weather Conditions: 79° F, Sunny

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 18.70 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 5.50 feet — Three Well Volumes 6.45 gallons

c. Length of Water Column 13.20 feet — One System Volume 343mL

2. WELL PURGING DATA:

a. Purge Method Sample Pro MP-SPK-4C portable bladder pump (S/N= 14112/14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1025 ~~15:23~~	~~5.46~~ 5.50	Pre-install							
1523	5.46	Start							
1525	5.83	Full Cell	21.56	7.04	0.611	143	2.23	31.4	Clear
1528	5.92	1000	21.47	7.01	0.602	152	2.74	29.3	Clear
1531	5.93	2000	21.53	7.00	0.585	165	3.70	23.7	Clear
1534	5.93	3000	21.52	7.01	0.574	179	4.81	18.0	Clear
1537	5.93	4000	21.81	7.04	0.572	190	6.24	13.6	Clear
1540	5.93	5000	21.04	7.05	0.576	195	6.09	12.7	Clear
1543	5.93	6000	21.84	7.06	0.580	202	6.47	9.85	Clear
1546	5.93	7000	21.77	7.08	0.585	206	6.61	7.18	Clear
1549	5.93	8000	21.84	7.09	0.588	208	6.50	6.34	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-17A

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW17A-GW-0918 Time Sampled: 15:50

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h$=$\pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3)$=(h ft)(9.65 mL/ft) = 118 mL

One System Volume = 343 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 14 feet below TOC

QA/QC Sample Collected = None

10 @ 5 @ 15 PSI @ 1523

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-14A

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/10/18

Weather Conditions: 79°F, sunny

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 18.11 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 7.11 feet — Three Well Volumes 5.4 gallons

c. Length of Water Column 11.00 feet — One System Volume 340 mL

2. WELL PURGING DATA:

a. Purge Method MasterFlex ES Peristaltic Pump (S/N = J15004067)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1630 ~~1620~~	7.11	Pre-install							
1620	7.45	Start							
1623	7.50	Full Cell	23.0	6.89	0.998	-86	1.28	6.98	Clear
1626	7.50	1000	21.88	6.81	1.03	-102	0.73	4.25	Clear
1629	7.52	2000	21.55	6.79	1.04	-106	0.55	3.28	Clear
1632	7.52	3000	21.45	6.79	1.04	-108	0.43	2.25	Clear
1635	7.52	4000	21.30	6.78	1.05	-110	0.35	2.08	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-14A

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW14A-GW-0918 Time Sampled: 1638

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h$=$\pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3)$=(h ft)(9.65 mL/ft) = 115 mL

One System Volume = 340 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 15 feet below TOC

QA/QC Sample Collected = None

Erik Day
Sampler (Signature)

Erik Day
(Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-20A

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/11/18

Weather Conditions: 67°F, sunny

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 22.04 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 4.66 feet — Three Well Volumes 8.52 gallons

c. Length of Water Column 17.38 feet — One System Volume 361 mL

2. WELL PURGING DATA:

a. Purge Method Sample Pro MP-SPK-4C portable bladder pump (S/N= 14112/14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
0949	5.05	Pre-install							
10:07	5.14	Start							
10:12	5.12	Full Cell	22.56	6.42	1.37	189	2.57	210	Milky-gray
10:15	5.15	400	21.79	6.48	1.37	189	1.72	170	Gray
10:18	5.28	900	20.17	6.51	1.34	184	1.28	121	Milky
10:21	5.29	1750	18.80	6.50	1.33	179	1.21	81.7	Milky
10:24	5.33	2600	18.36	6.50	1.34	177	1.44	71.1	Milky
10:27	5.45	3500	18.23	6.51	1.34	176	1.67	53.3	Milky
10:30	5.45	4500	18.21	6.52	1.34	175	6.65	38.6	Clear
10:33	5.45	5500	18.26	6.52	1.34	176	7.31	29.8	Clear
10:36	5.45	6500	18.29	6.52	1.35	176	7.04	27.1	Clear
10:39	5.45	7500	18.33	6.52	1.35	178	6.83	24.9	Clear
10:42	5.45	8500	18.41	6.52	1.35	176	6.61	19.6	Clear
10:45	5.45	9500	18.37	6.51	1.35	177	5.26	18.5	Clear
10:48	5.45	10250	18.41	6.52	1.35	178	4.96	17.2	Clear
10:51	5.45	11250	18.45	6.51	1.35	178	3.89	13.2	Clear
10:54	5.45	12250	18.45	6.52	1.35	178	3.75	10.7	Clear
10:57	5.45	13000	18.45	6.52	1.35	178	3.68	10.1	Clear
11:00	5.45	14000	18.53	6.51	1.35	178	3.50	8.9	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-20A

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW20A-GW-0918 Time Sampled: 11:04

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3)$=(h ft)(9.65 mL/ft) = 136 mL

One System Volume = 361 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 18 feet below TOC

QA/QC Sample Collected = EB01 collected after MW-20A

10.0 @ 5 @ 20 PSI
8.0 @ 7 @ 20 PSI @ 1017

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-10A

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/11/18

Weather Conditions: 70°F, sunny

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 20.26 feet

b. Depth to Water 4.15 feet

c. Length of Water Column 16.11 feet

Well Diameter 2-inch inner diameter

Three Well Volumes 7.89 gallons

One System Volume 352 mL

2. WELL PURGING DATA:

a. Purge Method Sample Pro MP-SPK-4C portable bladder pump (S/N= 14112/14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
11:40	4.70	Pre-install							
11:41	4.70	Start							
11:42	4.85	Full Cell	18.79	6.70	1.17	41	2.04	39.8	Clear
11:45	5.21	1000	18.15	6.82	1.19	3	1.86	25.6	Clear
11:48	5.34	2000	17.56	6.64	1.20	6	1.20	17.2	Clear
11:51	5.40	2750	17.29	6.66	1.19	14	7.86	14.6	Clear
11:54	~~5.35~~ 5.50	3750	17.21	6.69	1.19	21	7.65	12.7	Clear
11:57	5.44	4500	17.27	6.71	1.19	22	4.22	13.6	Clear
12:00	5.34	5250	17.35	6.71	1.20	22	3.97	9.40	Clear
12:03	5.34	6000	17.36	6.70	1.19	23	4.31	8.31	Clear
12:06	5.34	6750	17.25	6.71	1.19	26	3.78	11.2	Clear
12:09	5.34	7650	17.24	6.70	1.19	26	6.62	11.1	Clear
12:12	5.34	8500	17.27	6.70	1.19	25	6.04	11.2	Clear
12:15	5.34	9400	17.36	6.71	1.19	24	3.55	8.12	Clear
12:18	5.34	10300	17.18	6.71	1.19	24	3.45	7.15	Clear
12:21	5.34	11200	17.18	6.71	1.19	24	3.42	6.53	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-10A

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW10A-GW-0918 Time Sampled: 12:23

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (\text{h ft})(9.65\text{ mL/ft})$ = 127 mL

One System Volume = 352 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 16 feet below TOC

QA/QC Sample Collected = MS/MSD

16.0 @ 5 @ 20 PSI @
11.5 @ 3.5 @ 20 PSI @ 12:03

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MD-5

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/11/18

Weather Conditions: 79°F, sunny

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 25.00 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 4.92 feet — Three Well Volumes 10.17 gallons

c. Length of Water Column 20.08 feet — One System Volume 377 mL

2. WELL PURGING DATA:

a. Purge Method Sample Pro MP-SPK-4C portable bladder pump (S/N= 14112/14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1332	~~5.88~~ 5.78	Pre-install							
1337	5.72	Start							
1339	6.62	Full Cell	20.08	6.76	0.881	74	1.81	319	Lt. green
1342	7.02	1500	17.80	6.70	0.903	64	0.69	228	↓
1345	7.61	2500	17.68	6.72	0.905	49	0.59	110	Milky
1348	7.70	3500	17.61	6.73	0.905	44	0.51	78.5	↓
1351	7.90	4500	17.31	6.71	0.905	37	0.32	58.7	Hazy wht.
1354	8.15	5500	17.02	6.70	0.906	27	0.24	47.5	Clear
1357	8.01	6400	17.43	6.71	0.907	25	0.56	35.2	Clear
1400	7.97	7400	17.21	6.68	0.908	17	0.17	24.7	Clear
1403	7.95	8400	17.72	6.67	0.909	16	0.44	24.1	Clear
1406	7.95	9400	17.31	6.68	0.908	14	0.22	16.5	Clear
1409	7.95	10400	17.22	6.68	0.906	13	0.22	14.6	Clear
1412	7.95	11400	17.28	6.69	0.908	15	0.81	14.4	Clear
1415	7.95	12400	17.24	6.69	0.905	16	0.27	12.0	Clear
1418	7.95	13400	17.25	6.72	0.906	9	0.17	11.1	Clear
1421	7.95	14400	17.20	6.70	0.907	5	0.16	10.7	Clear
1424	7.95	15400	17.14	6.71	0.907	2	0.18	10.9	Clear
1427	7.95	16400	17.15	6.70	0.907	0	0.10	11.1	Clear
1430	7.95	17400	17.10	6.72	0.908	-1	0.14	9.85	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MD-5

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MD05-GW-0918 Time Sampled: 14:33

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (\text{h ft})(9.65\text{ mL/ft})$ = 152 mL

One System Volume = 377 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 21 feet below TOC

QA/QC Sample Collected = ~~MS/MSD~~ ESD None

10.0 @ 5.0 @ 20 PSI @ 13:37
11.0 @ 4.0 @ 20 PSI @ 13:56

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-3

Job No.: 11111346-003 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 9/11/18

Weather Conditions: 79°F, Sunny, breezy

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 17.05 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 5.82 feet — Three Well Volumes 5.49 gallons

c. Length of Water Column 11.23 feet — One System Volume

2. WELL PURGING DATA:

a. Purge Method Sample Pro MP-SPK-4C portable bladder pump (S/N= 14112/14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used Horiba U-52 Multi-Parameter Meter (S/N = SCHLOGBA) w/Flow Through Cell & Hach 2100 Q digital turbidity meter (S/N=B21457B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1507	6.20	Pre-install							
1510	6.12	Start							
1513	6.64	Full Cell	23.08	6.45	2.49	-112	2.73	50.8	~~Clear~~ Hazy
1516	6.70	1000	23.00	6.46	2.48	-115	2.45	42.0	Hazy
1519	6.45	1500	23.81	6.47	2.44	-112	2.66	29.3	Hazy
1522	6.30	2000	24.80	6.07	0.00	-97	7.22	43.2	Hazy
1525	6.65	2500	23.20	6.53	2.44	-110	3.65	58.0	Hazy
1528	6.68	3500	23.01	6.51	2.43	-106	3.66	47.8	Hazy
1531	6.74	4000	22.70	6.57	2.45	-106	3.88	43.3	Hazy
1534	6.74	4750	22.74	6.57	2.43	-103	3.74	43.5	Hazy
1537	6.67	5750	22.81	6.52	2.44	-103	3.63	40.3	"
1540	6.67	6250	22.88	6.54	2.44	-106	3.52	41.1	"
1543	6.56	6800	22.92	6.53	2.44	-101	3.44		
1546		Emptied flow cell							
1550	6.54	Full Cell							
1553	6.64	7800	22.76	6.51	2.42	-102	3.76	50.0	Hazy
1556	6.64	8800	22.64	6.52	2.43	-101	3.58	48.4	Hazy
1559	6.64	9800	22.52	6.53	2.43	-102	3.93	46.4	Hazy
1602	6.64	10600	22.39	6.49	2.44	-101	3.54	49.2	
1607		Emptied flow cell							
1613		Full Cell							
1616	7.00	12000	21.48	6.38	2.49	-101	3.40	23.0	Clear
1619	7.00	13000	21.64	6.37	2.49	-105	0.99	22.4	Clear
1622	7.00	14000	21.58	6.40	2.47	-110	1.05	20.8	Clear
1625	7.0	15000	21.55	6.39	2.48	-110	0.62	14.2	Clear
1628	7.0	16000	21.68	6.38	2.49	-113	0.56	12.6	Clear
1631	7.0	17000	21.62	6.40	2.50	-116	0.41	12.3	Clear
1634	7.0	18000	21.64	6.38	2.49	-118	0.50	11.4	Clear
1637	7.0	19000	21.71	6.38	2.47	-118	0.54	13.6	Clear
1640	7.0	20000	22.08	6.42	2.47	-120	1.12	12.5	Clear
1643	7.0	21000	22.41	6.39	2.50	-115	0.86	7.4	Clear
1646	7.0	22000	22.09	6.38	2.49	-119	0.79	8.7	Clear
1649	7.0	23000	22.00	6.37	2.48	-119	1.01	9.9	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-3

3. SAMPLE COLLECTION: Method Sample Pro portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW03-GW-0918 Time Sampled: 16:51

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (\text{h ft})(9.65\text{ mL/ft})$ = 109 mL

One System Volume = 334 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 13 feet below TOC

QA/QC Sample Collected = DP01

10.0 @ 5.0 @ 20PSI

Kink in hose caused lower flow from 1516-1522 - Kink taped and straightened @ 1523.

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-16A

Job No.: 11111346-002 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/14/19

Weather Conditions: 44°F, rain, wind SE 13 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 17.77 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 5.75 feet — Three Well Volumes 6.13 gallons

c. Length of Water Column 12.02 feet — One System Volume 280.3 mL

2. WELL PURGING DATA:

a. Purge Method SS portable bladder pump (S/N= 14112)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = B22002B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1205	5.75	Pre-install							
1217	5.75	Start							
1220	6.25	Full Cell	8.74	7.16	1.11	149.5	4.47	10.05	Clear
1223	6.40	750	8.89	7.18	1.09	138.3	5.97	8.76	Clear
1226	6.48	1500	8.67	7.21	1.07	131.8	7.19	9.46	Clear
1229	6.51	2250	8.54	7.25	1.06	125.2	8.19	9.03	Clear
1232	6.53	3000	8.60	7.27	1.06	121.4	8.73	9.15	Clear
1235	6.58	3750	8.68	7.30	1.06	117.0	9.37	6.94	Clear
1238	6.52	4500	8.53	7.32	1.06	114.6	9.52	7.95	Clear
1241	6.47	5000	8.29	7.32	1.07	116.1	9.62	6.26	Clear
1244	6.47	5500	8.21	7.32	1.07	112.3	9.61	6.53	Clear

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-16A

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW16A-GW-~~0916~~ 0319 Time Sampled: 1244

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(h\text{ ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (h\text{ ft})(9.65\text{ mL/ft})$ = 180.3 mL

One System Volume = 280.3 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 2' < TD

QA/QC Sample Collected = None

15 PSI 10R 5D at 1217
13 PSI 12R 3D at 1238

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-17A

Job No.: 11111346-002 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/14/19

Weather Conditions: 41°F, cloudy, wind W 13 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 18.70 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 5.95 feet — Three Well Volumes 6.50 gallons

c. Length of Water Column 12.75 feet — One System Volume 202.65 mL

2. WELL PURGING DATA:

a. Purge Method SS portable bladder pump (S/N= 14112)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = B22002B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1413	5.95	Pre-install							
1413	5.95	Start							
1415	6.19	Full Cell	13.64	7.18	0.50	127.2	4.26	57.9	Lt brown
1418	6.26	600	11.03	6.95	0.51	138.0	4.91	54.6	
1421	6.22	1100	10.26	6.92	0.51	136.8	*6.33	48.8	
1424	6.22	1600	9.97	6.95	0.51	131.3	7.54	51.7	
1427	6.22	2100	9.91	6.97	0.51	129.4	7.93	46.3	
1430	6.22	2600	10.11	7.01	0.52	125.3	8.73	41.0	
1433	6.22	3100	9.80	7.03	0.52	122.0	8.99	38.7	
1436	6.22	3600	9.75	7.07	0.52	119.5	9.19	41.3	
1439	6.22	4100	9.74	7.09	0.52	117.5	9.21	42.7	
1442	6.22	4600	9.73	7.11	0.52	114.7	9.11	39.2	
1445	6.22	5100	9.64	7.12	0.52	113.6	8.94	34.5	
1448	6.22	5600	9.64	7.12	0.52	112.2	8.64	31.8	
1451	6.22	6100	9.62	7.13	0.52	110.3	8.32	30.5	
1454	6.22	6600	9.63	7.13	0.52	108.9	8.01	28.7	
1457	6.22	7100	9.62	7.13	0.52	107.3	7.48	27.3	Clear
1500	6.22	7600	9.53	7.13	0.53	105.1	6.77	26.1	
1503	6.42	8300	9.63	7.13	0.52	103.2	6.21	23.8	
1506	6.42	9000	9.71	7.13	0.51	100.8	5.70	22.5	
1509	6.42	9700	9.66	7.14	0.51	99.5	5.54	23.1	
1512	6.42	10400	9.70	7.14	0.52	97.6	5.21	20.8	
1515	6.42	11100	9.75	7.15	0.53	96.8	4.94	19.4	
1518	6.42	11800	9.69	7.15	0.53	95.0	4.58	17.8	
1521	6.42	12500	9.70	7.16	0.53	93.0	4.38	14.1	
1524	6.42	13200	9.74	7.16	0.53	91.2	4.20	13.5	
1527	6.42	13900	9.72	7.18	0.52	88.1	4.15	12.1	
1530	6.42	14600	9.70	7.20	0.50	87.8	3.95	10.3	
1533	6.42	15300	9.58	7.22	0.48	85.0	3.75	9.8	
1536	6.42	16000	9.44	7.23	0.47	82.6	3.69	10.0	

KD

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-17A

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW17A-GW-~~0916~~ 0319 Time Sampled: 1536

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h$=$\pi((1/4\text{ in})/2)^2(h\text{ ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3)$=(h ft)(9.65 mL/ft) = 202.65 mL

One System Volume = 302.65 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 2' < TD

QA/QC Sample Collected = None

15 PSI 10R SD = 700 mL/min

Erik Day
Sampler (Signature)

Erik Day
(Print Name)

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-3

Job No.: 11111346-002 **Client:** Bemis Company, Inc.
Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/14/19
Weather Conditions: 37°F, cloudy, wind WNW 19 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 17.05 feet — Well Diameter 2-inch inner diameter
b. Depth to Water 6.89 feet — Three Well Volumes 5.18 gallons
c. Length of Water Column 10.16 feet — One System Volume 293 mL

2. WELL PURGING DATA:

a. Purge Method SS portable bladder pump (S/N= 14112)
b. Purge Requirements Low Flow Stabilization according to SOP.
c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = B220028)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1630	6.89	Pre-install							
1630	6.89	Start							
1632	7.32	Full Cell	9.88	6.79	3.63	57.7	0.97	358	Brown
1635	7.32	1200	10.00	6.82	3.78	17.4	1.55	327	
1638	7.32	1950	9.85	6.83	2.68	8.5	2.09	312	
1641	7.32	2700	9.93	6.86	3.80	-0.6	3.39	338	
1644	7.32	3450	10.02	6.87	3.70	-3.8	4.16	300	
1647	7.52	4150	9.96	6.89	3.39	-6.9	4.98	214	
1650	7.52	4900	9.89	6.89	3.30	-8.4	5.21	160	
1653	7.52	5650	9.89	6.90	3.31	-10.4	5.51	134	
1656	7.52	6650	9.81	6.91	3.21	-11.0	5.69	104	
1659	7.52	7650	9.92	6.91	0.01	-12.0	5.80	90.3	
1702	7.52	8650	10.05	6.92	0.01	-12.8	5.76	82.2	
1705	7.52	9650	10.06	6.93	0.01	-13.5	5.69	68.6	Lt brown
1708	7.52	10650	10.05	6.93	0.01	-13.8	5.66	46.8	
1711	7.52	11650	10.01	6.93	0.00	-13.8	5.73	44.3	Clear
1714	7.52	12650	9.97	6.93	0.01	-13.7	5.82	38.2	
1717	7.52	13650	9.96	6.93	0.02	-13.4	5.87	28.3	
1720	7.52	14650	9.97	6.93	0.00	-13.2	5.85	24.2	
1723	7.52	15650	9.53	6.94	3.36	-12.0	5.77	20.8	
1726	7.52	16650	9.58	6.93	3.35	-12.2	5.69	19.5	
1729	7.52	17650	9.56	6.93	3.32	-12.2	5.70	18.5	
1732	7.52	18650	9.59	6.93	3.29	-11.8	5.69	17.7	
1735	7.52	19650	9.52	6.93	3.28	-11.7	5.66	16.2	
1738	7.52	20650	9.51	6.93	3.26	-11.7	5.60	15.5	
1741	7.52	21650	9.54	6.93	3.24	-11.5	5.60	14.1	
1744	7.52	22650	9.51	6.93	3.22	-11.1	5.60	15.1	
1747	7.52	23650	9.54	6.93	3.21	-11.1	5.60	13.8	
1750	7.52	24650	9.46	6.93	3.16	-10.8	5.57	13.7	
1753	7.52	25650	9.52	6.93	3.15	-10.5	5.57	13.2	

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-3

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW03-GW-~~0916~~ 0319 Time Sampled: 1753

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (\text{h ft})(9.65\text{ mL/ft})$ = 193 mL

One System Volume = 293 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 2' < TD

QA/QC Sample Collected = DP01

15 PSI 8.5 R 6.5 R = 1000 mL / 3 min = 333 mL/min

Sampler (Signature) (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-20A

Job No.: 11111346-002 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/15/19

Weather Conditions: 37°F, sunny, windy – NW 19 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 22.04 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 3.21 feet — Three Well Volumes 9.60 gallons

c. Length of Water Column 18.83 feet — One System Volume 341.25 mL

2. WELL PURGING DATA:

a. Purge Method SS portable bladder pump (S/N= 14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = B22002B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
		Pre-install							
		Start							
1021	3.62	Full Cell	8.71	6.46	1.78	225.1	0.51	125	Gray
1024	3.62	1000	8.50	6.65	1.64	215.3	0.27	87	↓
1027	3.71	2000	7.69	6.42	1.65	195.8	0.13	92	↓
1030	3.71	3000	7.39	6.41	1.67	191.7	0.26	70.7	↓
1033	3.71	4000	7.27	6.39	1.68	189.1	0.60	30.0	Lt. Gray
1036	3.71	5000	7.30	6.39	1.69	185.9	1.35	28.1	↓
1039	3.71	6000	7.22	6.39	1.70	183.7	1.70	24.7	↓
1042	3.71	7000	7.19	6.40	1.71	181.6	2.39	21.7	↓
1045	3.71	8000	7.22	6.41	1.72	179.6	3.03	21.6	↓
1048	3.71	9000	7.21	6.42	1.72	178.8	3.60	17.9	Clear
1051	3.71	10000	7.27	6.43	1.73	176.5	3.85	15.3	
1054	3.71	11000	7.27	6.44	1.73	174.4	4.29	14.7	
1057	3.71	12000	7.22	6.44	1.74	173.6	4.49	13.5	
1100	3.71	13000	7.20	6.45	1.74	172.2	4.72	12.8	
1103	3.71	14000	7.23	6.45	1.75	172.2	4.94	11.7	
1106	3.71	15000	7.26	6.46	1.75	171.6	5.08	10.7	
1109	3.71	16000	7.25	6.46	1.76	171.1	5.24	9.96	

ESP

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-20A

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW20A-GW-~~0916~~ 0319 Time Sampled: 1109

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(h\text{ ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (h\text{ ft})(9.65\text{ mL/ft})$ = 241.25 mL

One System Volume = 341.25 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake =

QA/QC Sample Collected = EB01 collected after MW-20A

20 PSI 8R 7D

Erik Day
Sampler (Signature)

Erik Day
(Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-10A

Job No.: 11111346-002 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/15/19

Weather Conditions: 39°F, sunny, windy NW 21 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 20.26 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 4.20 feet — Three Well Volumes 8.19 gallons

c. Length of Water Column 16.06 feet — One System Volume 322 mL

2. WELL PURGING DATA:

a. Purge Method SS portable bladder pump (S/N= 14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = B220028)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1133	4.20	Pre-install							
1141	4.41	Start							
1141	4.75	Full Cell	7.80	7.08	1.28	190.0	3.27	62	Gray
1144	5.10	1000	8.04	7.03	1.29	177.4	4.47	56	
1147	5.09	2000	7.87	7.04	1.29	172.9	5.46	50	
1150	5.09	2500	7.96	7.04	1.29	169.0	6.21	30.9	
1153	5.09	3250	8.02	7.06	1.29	166.5	6.71	28.1	
1156	5.09	4000	7.99	7.06	1.29	165.7	6.95	24.6	
1159	5.09	4750	8.13	7.06	1.29	164.5	7.02	20.5	
1202	5.09	5500	8.17	7.06	1.29	163.9	7.00	19.0	
1205	5.09	6250	8.05	7.06	1.29	161.8	6.94	17.4	
1208	5.09	7000	8.24	7.06	1.29	160.2	6.89	15.0	
1211	5.09	7750	8.17	7.05	1.29	158.6	6.89	13.3	
1214	5.09	8500	8.13	7.06	1.29	157.4	6.86	12.3	
1217	5.09	9250	8.10	7.06	1.30	155.7	6.70	11.3	
1220	5.09	10000	8.09	7.05	1.29	153.6	6.69	10.2	
1223	5.09	10750	8.13	7.05	1.30	151.5	6.65	9.89	

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-10A

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW10A-GW-~~0916~~ 0319 Time Sampled: 1223

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(\text{h ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (\text{h ft})(9.65\text{ mL/ft})$ = 222 mL

One System Volume = 322 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 2' < TD

QA/QC Sample Collected = MS/MSD

20 PSI 11.5R 3.5D @ 1141
16 PSI 11.5R 3.5D @ 1144

Sampler (Signature) Erik Day (Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MD-5

Job No.: 11111346-002 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/15/19

Weather Conditions: 41°F, sunny, windy WNW 19 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 25.00 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 4.77 feet — Three Well Volumes 10.32 gallons

c. Length of Water Column 20.23 feet — One System Volume

2. WELL PURGING DATA:

a. Purge Method SS portable bladder pump (S/N= 14113)

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = B220020B)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1247	4.77	Pre-install							
1252	4.73	Start							
1253	4.90	Full Cell	8.63	7.21	1.13	192.0	7.27	1466.7	Orange
1257	5.46	1000	9.01	7.15	0.90	175.7	6.31	405	Orange
1303	6.08	2000	9.05	7.15	0.89	168.2	6.76	313	↓
1308	6.38	3000	9.16	7.15	0.89	165.7	6.98	290	
1313	6.55	4000	9.21	7.14	0.87	161.7	7.05	220	Brown
1318	6.65	5000	9.23	7.13	0.87	160.5	7.01	183	↓
1323	6.74	6000	9.15	7.12	0.87	158.5	6.92	144	Lt brown
1328	6.76	7000	9.33	7.10	0.86	158.1	6.84	113	
1333	6.79	8000	9.38	7.09	0.85	156.6	6.72	76	
1338	6.69	9000	9.41	7.08	0.85	155.7	6.67	64.5	
1343	6.58	10000	9.37	7.07	0.85	154.5	6.46	54.5	
1348	6.58	11000	9.41	7.07	0.84	154.2	6.33	49.2	
1353	6.58	12000	9.50	7.05	0.82	152.6	6.18	43.3	
1358	6.58	13000	9.44	7.05	0.82	152.7	6.15	39.0	
1403	6.58	14000	9.45	7.04	0.82	152.2	6.11	39.1	
1408	6.58	15000	9.57	7.04	0.82	152.0	6.10	39.1	
1413	6.58	16000	9.56	7.03	0.81	151.8	6.04	38.0	
1418	6.58	17000	9.67	7.03	0.81	151.7	6.02	37.8	

ESD

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MD-5

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MD05-GW-~~0916~~ 0319 Time Sampled: 1418

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(h\text{ ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (h\text{ ft})(9.65\text{ mL/ft})$ = 270.2 mL

One System Volume = 370.2

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 3' < TD

QA/QC Sample Collected = None

16 PSI 10R 5D = 200 mL/min

16 PSI 11R 4D at 1333 - trying to stabilize head

Carl Day
Sampler (Signature)

Eric Day
(Print Name)

GROUNDWATER SAMPLE COLLECTION RECORD

Well No. MW-14A

Job No.: 11111346-002 **Client:** Bemis Company, Inc.

Location: Bemis Company, Inc. – Des Moines, Iowa **Date:** 3/15/19

Weather Conditions: 44°F, partly cloudy, wind WNW 24 MPH

1. WATER LEVEL DATA: (from TOC)

a. Total Well Length (h) 18.11 feet — Well Diameter 2-inch inner diameter

b. Depth to Water 7.65 feet — Three Well Volumes 5.33 gallons

c. Length of Water Column 10.45 feet — One System Volume 294 mL

2. WELL PURGING DATA:

a. Purge Method ~~SS portable bladder pump (S/N= 08723)~~ Peristaltic Pump 08723

b. Purge Requirements Low Flow Stabilization according to SOP.

c. Field Testing Equipment Used In-Situ SmartTroll Multiparameter Meter (S/N = 625772) w/Flow Through Cell & Hach digital turbidity meter (S/N = 13200028)

Time	Depth to Water (ft)	Volume (mL)	Temp. (°C) (+/- 0.5)	pH (s.u.) (+/- 0.1)	Spec.Cond. (µΩ/cm) (+/- 3%)	ORP (mV) (+/- 10 mV)	DO (mg/L) (+/- 0.3)	Turbidity (NTU) (+/- 10% when >50 NTU)	Color (visual)
1535	7.65	Pre-install							
1540	7.65	Start							
1541	8.0	Full Cell	12.70	7.06	1.33	130.3	0.34	5.54	Clear
1545	8.05	800	12.70	7.03	1.33	84.2	0.20	2.34	
1547	8.05	1600	12.63	7.01	1.33	67.9	0.18	10.2	
1550	8.07	2400	12.66	7.01	1.33	53.8	0.14	2.75	
1553	8.07	3200	12.66	7.02	1.33	45.0	0.33	2.46	
1556	8.07	4000	12.79	7.01	1.34	38.6	0.37	2.53	
1559	8.07	4800	12.44	7.01	1.33	34.5	0.40	3.24	
1602		5600	12.57	7.00	1.34	31.1	0.26	3.46	

ESD

GROUNDWATER
SAMPLE COLLECTION RECORD
Well No. MW-14A

3. SAMPLE COLLECTION: Method SS portable bladder pump w/ disposable bladder and dedicated tubing

Container:	250-ml Plastic (1)	Preservation	HNO_3, 4 °C, pH <2	Analysis:	Total Arsenic
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	
Container:		Preservation		Analysis:	

Sample ID #: MW14A-GW-~~0916~~ 0319 Time Sampled: 1603

4. COMMENTS: Cell Volume = 125 mL; Bladder Volume = 100 mL

Tubing Volume=$\pi r^2 h = \pi((1/4\text{ in})/2)^2(h\text{ ft})(12\text{in}/1\text{ft})(2.54\text{ cm}/1\text{ in})^3(1\text{ mL}/1\text{cm}^3) = (h\text{ ft})(9.65\text{ mL/ft})$ = 194 mL

One System Volume = 294 mL

Sample pump to be set between the mid-point and the bottom of the screened interval.

Well screen from construction details = 10 feet long

Depth of sample intake = 2' < TD

QA/QC Sample Collected = None

Sampler (Signature) Erik Day (Print Name)

Appendix C
Laboratory Analytical Reports

September 25 2018

Sean Determan
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

RE: Bemis
11111346-003-01

Enclosed are the results of analyses for samples received by the laboratory on 09/12/18 13:10. If you have any questions concerning this report, please feel free to contact me at 1-800-858-5227.

ANALYTICAL REPORT FOR SAMPLES

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW16A-GW-0918	1I80874-01	Water	09/10/18 14:51	09/12/18 13:10
MW17A-GW-0918	1I80874-02	Water	09/10/18 15:50	09/12/18 13:10
MW14A-GW-0918	1I80874-03	Water	09/10/18 16:38	09/12/18 13:10
MW20A-GW-0918	1I80874-04	Water	09/11/18 11:04	09/12/18 13:10
MW10A-GW-0918	1I80874-05	Water	09/11/18 12:23	09/12/18 13:10
MD05-GW-0918	1I80874-06	Water	09/11/18 14:33	09/12/18 13:10
MW03-GW-0918	1I80874-07	Water	09/11/18 16:51	09/12/18 13:10
DP01	1I80874-08	Water	09/12/18 00:00	09/12/18 13:10
EB01	1I80874-09	Water	09/11/18 11:18	09/12/18 13:10
Purge Water Drums	1I80874-10	Water	09/11/18 17:48	09/12/18 13:10
Trip Blanks	1I80874-11	Water	09/10/18 13:30	09/12/18 13:10

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

CHAIN OF CUSTODY RECORD

Keystone LABORATORIES, INC.
600 East 17th Street South
Newton, IA 50208
641-792-8451

Page 1 o
Printed: 9/7/2018 3:18:24PM
www.keystonelabs.com

SITE INFORMATION
Sampler: Erik Day
Project: Bemis
11111346-003 ~~002~~-01

SPECIAL INSTRUCTIONS
None

Turn Around Time
☒ Standard ☐ RUSH, need by ___/___/___

REPORT TO
~~Sean Determan~~ Erik Day
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

LAB USE ONLY
Work Order 1I90874
Temperature
Turn-Cooler: No

INVOICE TO
Grant Anderson
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

☐ Custody Seal
☐ Containers Intact
☐ COC/Labels Agree
☐ Preservation Confirmed
☐ Received on Ice

Number	Sample Identification / Client ID	Matrix	Sample Type	Date	Time	Number of Containers	Analyses	Lab Sample Number
01-001	MW16A-GW-0918	Water	GRAB	9/10/18	14:51	1	~~8260-100~~ GS-+-6020	01
02-001	MW17A-GW-0918	Water	GRAB	9/10/18	15:50	1	ss-+-6020	02
02-002	MW14A-GW-0918	Water	GRAB	9/10/18	16:38	1	ss-+-6020	03
02-003	MW20A-GW-0918	Water	GRAB	9/11/18	11:04		ss-+-6020	04
02-004	MW10A-GW-0918	Water	GRAB	9/11/18	12:23	3	ss-+-6020 MS/MSD	05
02-005	MD05-GW-0918	Water	GRAB	9/11/18	14:33	1	ss-+-6020	06
02-006	MW03-GW-0918	Water	GRAB	9/11/18	16:51		ss-+-6020	07

Remarks:

Relinquished By	Date/Time	Relinquished By	Date/Time
Erik Day	9/12/18 0845	Grant H	9-12-18 1310
Received By	**Date/Time**	**Received for Lab By**	**Date/Time**

Original - Lab Copy Yellow - Sampler Copy

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Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Keystone LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

600 East 17th Street South
Newton, IA 50208
641-792-8451

Page 2 of 2
Printed: 9/7/2018 3:18:24PM
www.keystonelabs.com

SITE INFORMATION
Sampler: Erik Day
Project: Bemis 11111346-003 ~~002~~-01

SPECIAL INSTRUCTIONS
None

Turn Around Time
☒ Standard ☐ RUSH, need by __/__/__

REPORT TO
~~Sean Determan~~ Erik Day
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

LAB USE ONLY
Work Order: 1T80874
Temperature:
Turn-Cooler: No

☐ Custody Seal
☐ Containers Intact
☐ COC/Labels Agree
☐ Preservation Confirmed
☐ Received on Ice

INVOICE TO
Grant Anderson
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

Number	Sample Identification / Client ID	Matrix	Sample Type	Date	Time	Number of Containers	Analyses	Lab Sample Number
02-007	DP01	Water	GRAB	/ /		1	as-t-6020	08
02-008	EB01	Water	GRAB	9/11/18	11:18	1	as-t-6020	09
02-009	Purge Water Drums	Water	GRAB	9/11/18	17:48	4	as-t-6020, VOCs	10
02-010		Water	GRAB	/ /			as-t-6020	
02-011		Water	GRAB	/ /			as-t-6020	
02-012		Water	GRAB	/ /			as-t-6020	
03-001	Trip Blanks	Water	GRAB	9/10/18	13:30	2		11

Remarks:

Relinquished By: Erik Day Date/Time: 9/12/18 0845
Received By: Date/Time:
Relinquished By: Date/Time: 9-12-18 1310
Received by Lab By: Date/Time:

Original - Lab Copy Yellow - Sampler Copy

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MW16A-GW-0918

1I80874-01 (Water)

Date Sampled:9/10/2018 2:51:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1BI0698	09/19/18	09/21/18 14:47	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MW17A-GW-0918

1I80874-02 (Water)

Date Sampled:9/10/2018 3:50:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1BI0698	09/19/18	09/21/18 14:54	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MW14A-GW-0918

1I80874-03 (Water)

Date Sampled:9/10/2018 4:38:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	**0.129**	0.0040	mg/L	4	1BI0698	09/19/18	09/21/18 15:02	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MW20A-GW-0918

1I80874-04 (Water)

Date Sampled:9/11/2018 11:04:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1BI0698	09/19/18	09/21/18 15:10	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MW10A-GW-0918

1I80874-05 (Water)

Date Sampled:9/11/2018 12:23:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	**0.0306**	0.0040	mg/L	4	1BI0698	09/19/18	09/21/18 15:17	EPA 6020A	

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MD05-GW-0918

1I80874-06 (Water)

Date Sampled:9/11/2018 2:33:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	**0.0055**	0.0040	mg/L	4	1BI0698	09/19/18	09/21/18 15:25	EPA 6020A	

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Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

MW03-GW-0918

1I80874-07 (Water)

Date Sampled:9/11/2018 4:51:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	**0.174**	0.0040	mg/L	4	1BI0634	09/18/18	09/21/18 12:21	EPA 6020A	

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Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

DP01

1I80874-08 (Water)

Date Sampled:9/12/2018 12:00:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	**0.175**	0.0040	mg/L	4	1BI0634	09/18/18	09/21/18 12:44	EPA 6020A	

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Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

EB01

1I80874-09 (Water)

Date Sampled:9/11/2018 11:18:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1BI0634	09/18/18	09/21/18 12:52	EPA 6020A	

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Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Purge Water Drums

1I80874-10 (Water)

Date Sampled:9/11/2018 5:48:00PM

Keystone Laboratories, Inc. - Newton

Determination of Volatile Organic Compounds

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloromethane	ND	1.0	ug/L	1	1BI0565	09/14/18	09/14/18 11:43	EPA 8260B	
Vinyl Chloride	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethylene	ND	1.0	"	"	"	"	"	"	
Acetone	ND	10.0	"	"	"	"	"	"	
Carbon Disulfide	ND	1.0	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	"	"	"	"	"	"	
trans-1,2-Dichloroethylene	ND	1.0	"	"	"	"	"	"	
Methyl-t-butyl Ether (MTBE)	ND	2.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethylene	ND	1.0	"	"	"	"	"	"	
2-Butanone (MEK)	ND	5.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Carbon Tetrachloride	ND	1.0	"	"	"	"	"	"	
Benzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Trichloroethylene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
4-Methyl-2-pentanone (MIBK)	ND	5.0	"	"	"	"	"	"	
Toluene	ND	1.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethylene	ND	1.0	"	"	"	"	"	"	
2-Hexanone (MBK)	ND	5.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes, total	ND	2.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	

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Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Purge Water Drums

1I80874-10 (Water)

Date Sampled:9/11/2018 5:48:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Volatile Organic Compounds									
Surrogate: Dibromofluoromethane		*98.7 %*	*81-124*		*1BI0565*	*09/14/18*	*09/14/18 11:43*	*EPA 8260B*	
Surrogate: 1,2-Dichloroethane-d4		*100 %*	*66-139*		*"*	*"*	*"*	*"*	
Surrogate: Toluene-d8		*99.4 %*	*89-111*		*"*	*"*	*"*	*"*	
Surrogate: 4-Bromofluorobenzene		*97.4 %*	*84-111*		*"*	*"*	*"*	*"*	
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1BI0634	09/18/18	09/21/18 12:59	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Trip Blanks

1I80874-11 (Water)

Date Sampled:9/10/2018 1:30:00PM

Keystone Laboratories, Inc. - Newton

Determination of Volatile Organic Compounds

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloromethane	ND	1.0	ug/L	1	1BI0565	09/14/18	09/14/18 11:02	EPA 8260B	
Vinyl Chloride	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloroethylene	ND	1.0	"	"	"	"	"	"	
Acetone	ND	10.0	"	"	"	"	"	"	
Carbon Disulfide	ND	1.0	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	"	"	"	"	"	"	
trans-1,2-Dichloroethylene	ND	1.0	"	"	"	"	"	"	
Methyl-t-butyl Ether (MTBE)	ND	2.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethylene	ND	1.0	"	"	"	"	"	"	
2-Butanone (MEK)	ND	5.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Carbon Tetrachloride	ND	1.0	"	"	"	"	"	"	
Benzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Trichloroethylene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
4-Methyl-2-pentanone (MIBK)	ND	5.0	"	"	"	"	"	"	
Toluene	ND	1.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethylene	ND	1.0	"	"	"	"	"	"	
2-Hexanone (MBK)	ND	5.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes, total	ND	2.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Trip Blanks

1I80874-11 (Water)

Date Sampled:9/10/2018 1:30:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Volatile Organic Compounds									
Surrogate: Dibromofluoromethane		*80.2 %*	*81-124*		*1BI0565*	*09/14/18*	*09/14/18 11:02*	*EPA 8260B*	*S-GC*
Surrogate: 1,2-Dichloroethane-d4		*78.8 %*	*66-139*		*"*	*"*	*"*	*"*	
Surrogate: Toluene-d8		*123 %*	*89-111*		*"*	*"*	*"*	*"*	*S-GC*
Surrogate: 4-Bromofluorobenzene		*107 %*	*84-111*		*"*	*"*	*"*	*"*	

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Volatile Organic Compounds - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0565 - EPA 5030B										
Blank (1BI0565-BLK1)				Prepared & Analyzed: 09/14/18						
Chloromethane	ND	1.0	ug/L							
Vinyl Chloride	ND	1.0	"							
Bromomethane	ND	1.0	"							
Chloroethane	ND	1.0	"							
1,1-Dichloroethylene	ND	1.0	"							
Acetone	ND	10.0	"							
Carbon Disulfide	ND	1.0	"							
Methylene Chloride	ND	5.0	"							
trans-1,2-Dichloroethylene	ND	1.0	"							
Methyl-t-butyl Ether (MTBE)	ND	2.0	"							
1,1-Dichloroethane	ND	1.0	"							
cis-1,2-Dichloroethylene	ND	1.0	"							
2-Butanone (MEK)	ND	5.0	"							
Chloroform	ND	1.0	"							
1,1,1-Trichloroethane	ND	1.0	"							
Carbon Tetrachloride	ND	1.0	"							
Benzene	ND	1.0	"							
1,2-Dichloroethane	ND	1.0	"							
Trichloroethylene	ND	1.0	"							
1,2-Dichloropropane	ND	1.0	"							
Bromodichloromethane	ND	1.0	"							
cis-1,3-Dichloropropene	ND	1.0	"							
4-Methyl-2-pentanone (MIBK)	ND	5.0	"							
Toluene	ND	1.0	"							
trans-1,3-Dichloropropene	ND	1.0	"							
1,1,2-Trichloroethane	ND	1.0	"							
Tetrachloroethylene	ND	1.0	"							
2-Hexanone (MBK)	ND	5.0	"							
Dibromochloromethane	ND	1.0	"							
Chlorobenzene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes, total	ND	2.0	"							
Bromoform	ND	1.0	"							
1,1,2,2-Tetrachloroethane	ND	1.0	"							
1,3-Dichlorobenzene	ND	1.0	"							
1,4-Dichlorobenzene	ND	1.0	"							
1,2-Dichlorobenzene	ND	1.0	"							
Surrogate: Dibromofluoromethane	*49.0*		*"*	*50.0000*		*98.1*	*81-124*			
Surrogate: 1,2-Dichloroethane-d4	*49.9*		*"*	*50.0000*		*99.8*	*66-139*			
Surrogate: Toluene-d8	*51.0*		*"*	*50.0000*		*102*	*89-111*			
Surrogate: 4-Bromofluorobenzene	*47.0*		*"*	*50.0000*		*94.1*	*84-111*			

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Volatile Organic Compounds - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0565 - EPA 5030B										
LCS (1BI0565-BS1)				Prepared & Analyzed: 09/14/18						
Chloromethane	50.78	1.0	ug/L	49.7500		102	70-130			
Vinyl Chloride	53.05	1.0	"	49.7500		107	77-139			
Bromomethane	59.85	1.0	"	49.7500		120	65-144			
Chloroethane	51.20	1.0	"	50.0500		102	61-150			
1,1-Dichloroethylene	57.66	1.0	"	50.0000		115	85-128			
Acetone	89.61	10.0	"	100.300		89.3	52-167			
Carbon Disulfide	116.1	1.0	"	106.700		109	88-136			
Methylene Chloride	53.13	5.0	"	50.0000		106	81-131			
trans-1,2-Dichloroethylene	52.48	1.0	"	50.0000		105	82-129			
Methyl-t-butyl Ether (MTBE)	244.3	2.0	"	247.100		98.9	76-141			
1,1-Dichloroethane	51.34	1.0	"	50.0000		103	84-124			
cis-1,2-Dichloroethylene	52.48	1.0	"	50.0000		105	87-126			
2-Butanone (MEK)	124.9	5.0	"	121.600		103	47-190			
Chloroform	54.97	1.0	"	50.0000		110	87-126			
1,1,1-Trichloroethane	52.52	1.0	"	50.0000		105	77-131			
Carbon Tetrachloride	53.07	1.0	"	50.0000		106	75-131			
Benzene	52.59	1.0	"	50.0000		105	84-128			
1,2-Dichloroethane	52.70	1.0	"	50.0000		105	84-126			
Trichloroethylene	51.61	1.0	"	50.0000		103	87-126			
1,2-Dichloropropane	55.69	1.0	"	50.0000		111	88-123			
Bromodichloromethane	49.06	1.0	"	50.0000		98.1	81-117			
cis-1,3-Dichloropropene	51.53	1.0	"	50.0000		103	86-130			
4-Methyl-2-pentanone (MIBK)	107.3	5.0	"	99.1000		108	74-139			
Toluene	51.60	1.0	"	50.0000		103	85-123			
trans-1,3-Dichloropropene	50.65	1.0	"	50.0000		101	87-132			
1,1,2-Trichloroethane	54.62	1.0	"	50.0000		109	84-126			
Tetrachloroethylene	54.35	1.0	"	50.0000		109	84-123			
2-Hexanone (MBK)	103.6	5.0	"	102.500		101	57-150			
Dibromochloromethane	50.95	1.0	"	50.0000		102	81-118			
Chlorobenzene	52.88	1.0	"	50.0000		106	85-119			
Ethylbenzene	53.35	1.0	"	50.0000		107	82-121			
Xylenes, total	158.4	2.0	"	150.000		106	85-120			
Bromoform	49.57	1.0	"	50.0000		99.1	85-120			
1,1,2,2-Tetrachloroethane	57.17	1.0	"	50.0000		114	63-137			
1,3-Dichlorobenzene	56.14	1.0	"	50.0000		112	72-130			
1,4-Dichlorobenzene	56.61	1.0	"	50.0000		113	72-127			
1,2-Dichlorobenzene	56.11	1.0	"	50.0000		112	77-127			
Surrogate: Dibromofluoromethane	*49.4*		*"*	*50.0000*		*98.8*	*81-124*			
Surrogate: 1,2-Dichloroethane-d4	*49.2*		*"*	*50.0000*		*98.5*	*66-139*			
Surrogate: Toluene-d8	*49.9*		*"*	*50.0000*		*99.9*	*89-111*			
Surrogate: 4-Bromofluorobenzene	*49.0*		*"*	*50.0000*		*98.1*	*84-111*			

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Volatile Organic Compounds - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0565 - EPA 5030B										
LCS Dup (1BI0565-BSD1)				Prepared & Analyzed: 09/14/18						
Chloromethane	48.99	1.0	ug/L	49.7500		98.5	70-130	3.59	30	
Vinyl Chloride	51.82	1.0	"	49.7500		104	77-139	2.35	27	
Bromomethane	58.03	1.0	"	49.7500		117	65-144	3.09	30	
Chloroethane	49.37	1.0	"	50.0500		98.6	61-150	3.64	21	
1,1-Dichloroethylene	55.04	1.0	"	50.0000		110	85-128	4.65	25	
Acetone	95.38	10.0	"	100.300		95.1	52-167	6.24	23	
Carbon Disulfide	112.4	1.0	"	106.700		105	88-136	3.19	24	
Methylene Chloride	51.40	5.0	"	50.0000		103	81-131	3.31	24	
trans-1,2-Dichloroethylene	50.77	1.0	"	50.0000		102	82-129	3.31	26	
Methyl-t-butyl Ether (MTBE)	245.0	2.0	"	247.100		99.2	76-141	0.290	22	
1,1-Dichloroethane	50.05	1.0	"	50.0000		100	84-124	2.54	28	
cis-1,2-Dichloroethylene	51.46	1.0	"	50.0000		103	87-126	1.96	25	
2-Butanone (MEK)	123.7	5.0	"	121.600		102	47-190	0.958	24	
Chloroform	53.34	1.0	"	50.0000		107	87-126	3.01	26	
1,1,1-Trichloroethane	51.01	1.0	"	50.0000		102	77-131	2.92	26	
Carbon Tetrachloride	50.92	1.0	"	50.0000		102	75-131	4.14	27	
Benzene	50.64	1.0	"	50.0000		101	84-128	3.78	22	
1,2-Dichloroethane	51.81	1.0	"	50.0000		104	84-126	1.70	20	
Trichloroethylene	50.31	1.0	"	50.0000		101	87-126	2.55	24	
1,2-Dichloropropane	53.80	1.0	"	50.0000		108	88-123	3.45	25	
Bromodichloromethane	46.87	1.0	"	50.0000		93.7	81-117	4.57	26	
cis-1,3-Dichloropropene	50.23	1.0	"	50.0000		100	86-130	2.56	25	
4-Methyl-2-pentanone (MIBK)	105.7	5.0	"	99.1000		107	74-139	1.52	23	
Toluene	49.06	1.0	"	50.0000		98.1	85-123	5.05	24	
trans-1,3-Dichloropropene	50.04	1.0	"	50.0000		100	87-132	1.21	26	
1,1,2-Trichloroethane	53.61	1.0	"	50.0000		107	84-126	1.87	24	
Tetrachloroethylene	51.39	1.0	"	50.0000		103	84-123	5.60	29	
2-Hexanone (MBK)	104.0	5.0	"	102.500		101	57-150	0.385	27	
Dibromochloromethane	49.34	1.0	"	50.0000		98.7	81-118	3.21	27	
Chlorobenzene	50.26	1.0	"	50.0000		101	85-119	5.08	29	
Ethylbenzene	50.29	1.0	"	50.0000		101	82-121	5.91	26	
Xylenes, total	151.2	2.0	"	150.000		101	85-120	4.64	25	
Bromoform	49.00	1.0	"	50.0000		98.0	85-120	1.16	26	
1,1,2,2-Tetrachloroethane	51.00	1.0	"	50.0000		102	63-137	11.4	30	
1,3-Dichlorobenzene	49.03	1.0	"	50.0000		98.1	72-130	13.5	30	
1,4-Dichlorobenzene	49.35	1.0	"	50.0000		98.7	72-127	13.7	30	
1,2-Dichlorobenzene	48.91	1.0	"	50.0000		97.8	77-127	13.7	30	
Surrogate: Dibromofluoromethane	*50.5*		*"*	*50.0000*		*101*	*81-124*			
Surrogate: 1,2-Dichloroethane-d4	*50.4*		*"*	*50.0000*		*101*	*66-139*			
Surrogate: Toluene-d8	*49.2*		*"*	*50.0000*		*98.5*	*89-111*			
Surrogate: 4-Bromofluorobenzene	*50.2*		*"*	*50.0000*		*100*	*84-111*			

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Volatile Organic Compounds - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0565 - EPA 5030B										
Matrix Spike (1BI0565-MS1)		**Source: 1I80706-05**		Prepared & Analyzed: 09/14/18						
Chloromethane	487.5	10.0	ug/L	497.500	ND	98.0	65-134			
Vinyl Chloride	532.8	10.0	"	497.500	ND	107	68-146			
Bromomethane	574.1	10.0	"	497.500	ND	115	66-136			
Chloroethane	507.3	10.0	"	500.500	ND	101	53-155			
1,1-Dichloroethylene	572.2	10.0	"	500.000	ND	114	68-142			
Acetone	1132	100	"	1003.00	ND	113	64-192			
Carbon Disulfide	1144	10.0	"	1067.00	ND	107	70-150			
Methylene Chloride	540.8	50.0	"	500.000	ND	108	73-134			
trans-1,2-Dichloroethylene	534.6	10.0	"	500.000	ND	107	76-134			
Methyl-t-butyl Ether (MTBE)	2621	20.0	"	2471.00	ND	106	74-141			
1,1-Dichloroethane	520.7	10.0	"	500.000	ND	104	80-126			
cis-1,2-Dichloroethylene	528.9	10.0	"	500.000	ND	106	84-127			
2-Butanone (MEK)	1470	50.0	"	1216.00	ND	121	56-190			
Chloroform	544.8	10.0	"	500.000	ND	109	83-129			
1,1,1-Trichloroethane	514.7	10.0	"	500.000	ND	103	71-137			
Carbon Tetrachloride	503.9	10.0	"	500.000	ND	101	64-139			
Benzene	503.8	10.0	"	500.000	ND	101	81-129			
1,2-Dichloroethane	523.7	10.0	"	500.000	ND	105	83-128			
Trichloroethylene	504.3	10.0	"	500.000	ND	101	84-128			
1,2-Dichloropropane	540.7	10.0	"	500.000	ND	108	84-127			
Bromodichloromethane	463.8	10.0	"	500.000	ND	92.8	81-117			
cis-1,3-Dichloropropene	471.5	10.0	"	500.000	ND	94.3	82-123			
4-Methyl-2-pentanone (MIBK)	1167	50.0	"	991.000	ND	118	76-145			
Toluene	495.3	10.0	"	500.000	ND	99.1	80-126			
trans-1,3-Dichloropropene	476.7	10.0	"	500.000	ND	95.3	81-126			
1,1,2-Trichloroethane	546.1	10.0	"	500.000	ND	109	85-127			
Tetrachloroethylene	486.1	10.0	"	500.000	ND	97.2	69-127			
2-Hexanone (MBK)	1176	50.0	"	1025.00	ND	115	58-153			
Dibromochloromethane	494.6	10.0	"	500.000	ND	98.9	81-115			
Chlorobenzene	479.7	10.0	"	500.000	ND	95.9	78-118			
Ethylbenzene	487.9	10.0	"	500.000	ND	97.6	74-126			
Xylenes, total	1468	20.0	"	1500.00	ND	97.8	52-145			
Bromoform	502.9	10.0	"	500.000	ND	101	82-118			
1,1,2,2-Tetrachloroethane	550.3	10.0	"	500.000	ND	110	63-138			
1,3-Dichlorobenzene	482.4	10.0	"	500.000	ND	96.5	71-124			
1,4-Dichlorobenzene	476.2	10.0	"	500.000	ND	95.2	68-124			
1,2-Dichlorobenzene	489.7	10.0	"	500.000	ND	97.9	75-127			
Surrogate: Dibromofluoromethane	*497*		*"*	*500.000*		*99.4*	*81-124*			
Surrogate: 1,2-Dichloroethane-d4	*508*		*"*	*500.000*		*102*	*66-139*			
Surrogate: Toluene-d8	*496*		*"*	*500.000*		*99.1*	*89-111*			
Surrogate: 4-Bromofluorobenzene	*503*		*"*	*500.000*		*101*	*84-111*			

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Volatile Organic Compounds - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0565 - EPA 5030B										
Matrix Spike Dup (1BI0565-MSD1)		**Source: 1I80706-05**		Prepared & Analyzed: 09/14/18						
Chloromethane	504.6	10.0	ug/L	497.500	ND	101	65-134	3.45	18	
Vinyl Chloride	543.5	10.0	"	497.500	ND	109	68-146	1.99	14	
Bromomethane	599.2	10.0	"	497.500	ND	120	66-136	4.28	20	
Chloroethane	512.0	10.0	"	500.500	ND	102	53-155	0.922	19	
1,1-Dichloroethylene	577.4	10.0	"	500.000	ND	115	68-142	0.905	16	
Acetone	1072	100	"	1003.00	ND	107	64-192	5.43	18	
Carbon Disulfide	1156	10.0	"	1067.00	ND	108	70-150	1.04	15	
Methylene Chloride	543.8	50.0	"	500.000	ND	109	73-134	0.553	15	
trans-1,2-Dichloroethylene	540.3	10.0	"	500.000	ND	108	76-134	1.06	16	
Methyl-t-butyl Ether (MTBE)	2635	20.0	"	2471.00	ND	107	74-141	0.502	16	
1,1-Dichloroethane	527.5	10.0	"	500.000	ND	106	80-126	1.30	17	
cis-1,2-Dichloroethylene	537.4	10.0	"	500.000	ND	107	84-127	1.59	17	
2-Butanone (MEK)	1432	50.0	"	1216.00	ND	118	56-190	2.61	17	
Chloroform	552.9	10.0	"	500.000	ND	111	83-129	1.48	17	
1,1,1-Trichloroethane	526.5	10.0	"	500.000	ND	105	71-137	2.27	15	
Carbon Tetrachloride	512.9	10.0	"	500.000	ND	103	64-139	1.77	16	
Benzene	508.1	10.0	"	500.000	ND	102	81-129	0.850	14	
1,2-Dichloroethane	526.9	10.0	"	500.000	ND	105	83-128	0.609	17	
Trichloroethylene	512.8	10.0	"	500.000	ND	103	84-128	1.67	14	
1,2-Dichloropropane	552.8	10.0	"	500.000	ND	111	84-127	2.21	17	
Bromodichloromethane	467.8	10.0	"	500.000	ND	93.6	81-117	0.859	17	
cis-1,3-Dichloropropene	476.0	10.0	"	500.000	ND	95.2	82-123	0.950	17	
4-Methyl-2-pentanone (MIBK)	1166	50.0	"	991.000	ND	118	76-145	0.0686	16	
Toluene	497.8	10.0	"	500.000	ND	99.6	80-126	0.503	13	
trans-1,3-Dichloropropene	481.1	10.0	"	500.000	ND	96.2	81-126	0.919	17	
1,1,2-Trichloroethane	547.7	10.0	"	500.000	ND	110	85-127	0.293	15	
Tetrachloroethylene	491.6	10.0	"	500.000	ND	98.3	69-127	1.13	16	
2-Hexanone (MBK)	1174	50.0	"	1025.00	ND	114	58-153	0.179	14	
Dibromochloromethane	493.6	10.0	"	500.000	ND	98.7	81-115	0.202	15	
Chlorobenzene	488.9	10.0	"	500.000	ND	97.8	78-118	1.90	17	
Ethylbenzene	500.8	10.0	"	500.000	ND	100	74-126	2.61	13	
Xylenes, total	1504	20.0	"	1500.00	ND	100	52-145	2.44	13	
Bromoform	508.8	10.0	"	500.000	ND	102	82-118	1.17	14	
1,1,2,2-Tetrachloroethane	556.9	10.0	"	500.000	ND	111	63-138	1.19	15	
1,3-Dichlorobenzene	502.7	10.0	"	500.000	ND	101	71-124	4.12	15	
1,4-Dichlorobenzene	506.1	10.0	"	500.000	ND	101	68-124	6.09	16	
1,2-Dichlorobenzene	509.7	10.0	"	500.000	ND	102	75-127	4.00	25	
Surrogate: Dibromofluoromethane	*502*		*"*	*500.000*		*100*	*81-124*			
Surrogate: 1,2-Dichloroethane-d4	*510*		*"*	*500.000*		*102*	*66-139*			
Surrogate: Toluene-d8	*496*		*"*	*500.000*		*99.2*	*89-111*			
Surrogate: 4-Bromofluorobenzene	*498*		*"*	*500.000*		*99.6*	*84-111*			

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 | 600 East 17th Street South Newton, IA 50208 | Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Total Metals - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0634 - EPA 3005A Total Recoverable Metals										
Blank (1BI0634-BLK1)				Prepared: 09/18/18 Analyzed: 09/21/18						
Arsenic, total	ND	0.0040	mg/L							
LCS (1BI0634-BS1)				Prepared: 09/18/18 Analyzed: 09/21/18						
Arsenic, total	0.0918	0.0040	mg/L	0.100000		91.8	80-120			
Matrix Spike (1BI0634-MS1)		**Source: 1I80584-13**		Prepared: 09/18/18 Analyzed: 09/21/18						
Arsenic, total	0.164	0.0040	mg/L	0.100000	0.0776	86.2	75-125			
Matrix Spike Dup (1BI0634-MSD1)		**Source: 1I80584-13**		Prepared: 09/18/18 Analyzed: 09/21/18						
Arsenic, total	0.170	0.0040	mg/L	0.100000	0.0776	92.4	75-125	3.67	20	
Post Spike (1BI0634-PS1)		**Source: 1I80584-13**		Prepared: 09/18/18 Analyzed: 09/21/18						
Arsenic, total	0.147		mg/L	0.0800000	0.0760	89.0	80-120			
Batch 1BI0698 - EPA 3005A Total Recoverable Metals										
Blank (1BI0698-BLK1)				Prepared: 09/19/18 Analyzed: 09/21/18						
Arsenic, total	ND	0.0040	mg/L							
LCS (1BI0698-BS1)				Prepared: 09/19/18 Analyzed: 09/21/18						
Arsenic, total	0.0864	0.0040	mg/L	0.100000		86.4	80-120			
Matrix Spike (1BI0698-MS1)		**Source: 1I80874-05**		Prepared: 09/19/18 Analyzed: 09/21/18						
Arsenic, total	0.118	0.0040	mg/L	0.100000	0.0306	87.9	75-125			
Matrix Spike Dup (1BI0698-MSD1)		**Source: 1I80874-05**		Prepared: 09/19/18 Analyzed: 09/21/18						
Arsenic, total	0.122	0.0040	mg/L	0.100000	0.0306	91.6	75-125	3.09	20	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 | 600 East 17th Street South Newton, IA 50208 | Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Determination of Total Metals - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1BI0698 - EPA 3005A Total Recoverable Metals										
Post Spike (1BI0698-PS1)		**Source: 1I80874-05**		Prepared: 09/19/18 Analyzed: 09/21/18						
Arsenic, total	0.102		mg/L	0.0800000	0.0300	90.2	80-120			

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Certified Analyses Included in This Report

Method/Matrix	Analyte	Certifications
EPA 6020A in Water		
	Arsenic, total	SIA1X,KS-NT
EPA 8260B in Water		
	Chloromethane	KS-NT,SIA1X
	Vinyl Chloride	KS-NT,SIA1X
	Bromomethane	KS-NT,SIA1X
	Chloroethane	KS-NT,SIA1X
	1,1-Dichloroethylene	KS-NT,SIA1X
	Acetone	KS-NT,SIA1X
	Carbon Disulfide	KS-NT,SIA1X
	Methylene Chloride	KS-NT,SIA1X
	trans-1,2-Dichloroethylene	KS-NT,SIA1X
	Methyl-t-butyl Ether (MTBE)	KS-NT,SIA1X
	1,1-Dichloroethane	KS-NT,SIA1X
	cis-1,2-Dichloroethylene	KS-NT,SIA1X
	2-Butanone (MEK)	KS-NT,SIA1X
	Chloroform	KS-NT,SIA1X
	1,1,1-Trichloroethane	KS-NT,SIA1X
	Carbon Tetrachloride	KS-NT,SIA1X
	Benzene	KS-NT,SIA1X
	1,2-Dichloroethane	KS-NT,SIA1X
	Trichloroethylene	KS-NT,SIA1X
	1,2-Dichloropropane	KS-NT,SIA1X
	Bromodichloromethane	KS-NT,SIA1X
	cis-1,3-Dichloropropene	KS-NT,SIA1X
	4-Methyl-2-pentanone (MIBK)	KS-NT,SIA1X
	Toluene	KS-NT,SIA1X
	trans-1,3-Dichloropropene	KS-NT,SIA1X
	1,1,2-Trichloroethane	KS-NT,SIA1X
	Tetrachloroethylene	KS-NT,SIA1X
	2-Hexanone (MBK)	KS-NT,SIA1X
	Dibromochloromethane	KS-NT,SIA1X
	Chlorobenzene	KS-NT,SIA1X
	Ethylbenzene	KS-NT,SIA1X
	Xylenes, total	KS-NT,SIA1X
	Bromoform	KS-NT,SIA1X
	1,1,2,2-Tetrachloroethane	KS-NT,SIA1X
	1,3-Dichlorobenzene	KS-NT,SIA1X
	1,4-Dichlorobenzene	KS-NT,SIA1X
	1,2-Dichlorobenzene	KS-NT,SIA1X

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GHD-DSM	Project:	Bemis	Reported
11228 Aurora Ave	Project Number:	11111346-003-01	09/25/18 16:42
Des Moines, IA 50322	Project Manager:	Sean Determan	

Code	Certifying Authority	Certificate Number	Expires
KS-KC	Kansas Department of Health and Environment-KC	E-10110	04/30/2019
KS-NT	Kansas Department of Health and Environment (NELAP	E-10287	10/31/2018
MO-KC	Missouri Department of Natural Resources	140	04/30/2019
SIA1X	Iowa Department of Natural Resources	95	02/01/2019

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Notes and Definitions

S-GC	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: 11111346-003-01 Project Manager: Sean Determan	Reported 09/25/18 16:42

Leslie Taylor

Leslie Taylor

Project Manager I

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

March 22 2019

Kevin Armstrong
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

RE: Bemis
SSOW 11111346-001

Enclosed are the results of analyses for samples received by the laboratory on 03/18/19 11:30. If you have any questions concerning this report, please feel free to contact me at 1-800-858-5227.

ANALYTICAL REPORT FOR SAMPLES

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-14A-GW-0319	1C91168-01	Water	03/15/19 16:03	03/18/19 11:30
MW-16A-GW-0319	1C91168-02	Water	03/14/19 12:44	03/18/19 11:30
MW-17A-GW-0319	1C91168-03	Water	03/14/19 15:36	03/18/19 11:30
MW-3-GW-0319	1C91168-04	Water	03/14/19 17:53	03/18/19 11:30
MW-20A-GW-0319	1C91168-05	Water	03/15/19 11:09	03/18/19 11:30
MW-10A-GW-0319	1C91168-06	Water	03/15/19 12:23	03/18/19 11:30
MD-5-GW-0319	1C91168-07	Water	03/15/19 14:18	03/18/19 11:30
EB-01-GW-0319	1C91168-08	Water	03/15/19 00:00	03/18/19 11:30
DP-01-GW-0319	1C91168-09	Water	03/14/19 00:00	03/18/19 11:30

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

CHAIN OF CUSTODY RECORD

Keystone LABORATORIES, INC.

600 East 17th Street South
Newton, IA 50208
641-792-8451

Page 1 of 2
Printed: 3/12/2019 9:25:34AM
www.keystonelabs.com

SITE INFORMATION
Sampler: Erik Day
Project: Bemis
SSOW 11111346-001

REPORT TO
Kevin Armstrong
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

INVOICE TO
Grant Anderson
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

SPECIAL INSTRUCTIONS
None

Turn Around Time
☒ Standard ☐ RUSH, need by __/__/__

LAB USE ONLY
Work Order: 1C91168
Temperature:
Turn-Cooler: No

☐ Custody Seal
☐ Containers Intact
☐ COC/Labels Agree
☐ Preservation Confirmed
☐ Received on Ice

Number	Sample Identification / Client ID	Matrix	Sample Type	Date	Time	Number of Containers	Analyses	Lab Sample Number
01-001	MW44A-GW-0319	Water	GRAB	3/15/19	1603	1	as-t-6020	01
01-002	MW-16A-GW-0319	Water	GRAB	3/14/19	1244	1	as-t-6020	02
01-003	MW-17A-GW-0319	Water	GRAB	3/14/19	1536	1	as-t-6020	03
01-004	MW-3-GW-0319	Water	GRAB	3/14/19	1753	1	as-t-6020	04
01-005	MW-20A-GW-0319	Water	GRAB	3/15/19	1109	1	as-t-6020	05
01-006	MW-10A-GW-0319	Water	GRAB	3/15/19	1223	3	as-t-6020	06
01-007	MD-5-GW-0319	Water	GRAB	3/15/19	1418	1	as-t-6020	07

Relinquished By: [signature] Date/Time: 3/17/19 1815
Received By: Date/Time:

Relinquished By: Date/Time:
Received for Lab By: [signature] Date/Time: 3-18-19 11:30

Original - Lab Copy Yellow - Sampler Copy

Remarks: MW-10A-GW-0319: 3X volume for MS/MSD

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

Keystone LABORATORIES, INC.

CHAIN OF CUSTODY RECORD

600 East 17th Street South
Newton, IA 50208
641-792-8451

Page 2 of 2
Printed: 3/12/2019 9:25:34AM
www.keystonelabs.com

SITE INFORMATION
Sampler: Erik Day
Project: Bemis
SSOW 11111346-001

SPECIAL INSTRUCTIONS
None

Turn Around Time
☒ Standard ☐ RUSH, need by __/__/__

REPORT TO
Kevin Armstrong
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

INVOICE TO
Grant Anderson
GHD-DSM
11228 Aurora Ave
Des Moines, IA 50322

LAB USE ONLY
Work Order 1091168
Temperature
Turn-Cooler: No
☐ Custody Seal
☐ Containers Intact
☐ COC/Labels Agree
☐ Preservation Confirmed
☐ Received on Ice

Number	Sample Identification / Client ID	Matrix	Sample Type	Date	Time	Number of Containers	Analyses	Lab Sample Number
01-008	EB-01-GW-0314	Water	GRAB	3/15/19		1	[illegible]-6020	08
01-009	DP-01-GW-0319	Water	GRAB	3/14/19		1	[illegible]-6020	09
01-010		Water	GRAB	/ /			[illegible]-6020	—
01-011		Water	GRAB	/ /			[illegible]-6020	—
01-012		Water	GRAB	/ /			[illegible]-6020	—

Relinquished By: Erik Day — Date/Time: 3/17/19 1815
Received By — Date/Time
Relinquished By — Date/Time
Received for Lab By — Date/Time: 3-18-19 11:30
Original - Lab Copy — Yellow - Sampler Copy

Remarks:

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 | 600 East 17th Street South, Newton, IA 50208 | Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

MW-14A-GW-0319

1C91168-01 (Water)

Date Sampled:3/15/2019 4:03:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	**0.139**	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 17:42	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

MW-16A-GW-0319

1C91168-02 (Water)

Date Sampled:3/14/2019 12:44:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	ND	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 17:48	EPA 6020A	

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

MW-17A-GW-0319

1C91168-03 (Water)

Date Sampled:3/14/2019 3:36:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	ND	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 17:54	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

MW-3-GW-0319

1C91168-04 (Water)

Date Sampled:3/14/2019 5:53:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	**0.131**	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 18:00	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Project Number: Project Manager:	Bemis SSOW 11111346-001 Kevin Armstrong	Reported 03/22/19 13:10

MW-20A-GW-0319

1C91168-05 (Water)

Date Sampled:3/15/2019 11:09:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 18:07	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

MW-10A-GW-0319

1C91168-06 (Water)

Date Sampled:3/15/2019 12:23:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	**0.0263**	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 18:25	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

MD-5-GW-0319

1C91168-07 (Water)

Date Sampled:3/15/2019 2:18:00PM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	**0.0075**	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 18:49	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

EB-01-GW-0319

1C91168-08 (Water)

Date Sampled:3/15/2019 12:00:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Keystone Laboratories, Inc. - Newton									
Determination of Total Metals									
Arsenic, total	ND	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 18:55	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

DP-01-GW-0319

1C91168-09 (Water)

Date Sampled:3/14/2019 12:00:00AM

Keystone Laboratories, Inc. - Newton

Determination of Total Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Arsenic, total	**0.142**	0.0040	mg/L	4	1CC0727	03/19/19	03/20/19 19:01	EPA 6020A	

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451 600 East 17th Street South Newton, IA 50208 Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Project Number: Project Manager:	Bemis SSOW 11111346-001 Kevin Armstrong	Reported 03/22/19 13:10

Determination of Total Metals - Quality Control

Keystone Laboratories, Inc. - Newton

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1CC0727 - EPA 3005A Total Recoverable Metals										
Blank (1CC0727-BLK1)				Prepared: 03/19/19 Analyzed: 03/20/19						
Arsenic, total	ND	0.0040	mg/L							
LCS (1CC0727-BS1)				Prepared: 03/19/19 Analyzed: 03/20/19						
Arsenic, total	0.100	0.0040	mg/L	0.100000		100	80-120			
Matrix Spike (1CC0727-MS1)		**Source: 1C91168-06**		Prepared: 03/19/19 Analyzed: 03/20/19						
Arsenic, total	0.121	0.0040	mg/L	0.100000	0.0263	94.6	75-125			
Matrix Spike Dup (1CC0727-MSD1)		**Source: 1C91168-06**		Prepared: 03/19/19 Analyzed: 03/20/19						
Arsenic, total	0.118	0.0040	mg/L	0.100000	0.0263	91.6	75-125	2.51	20	
Post Spike (1CC0727-PS1)		**Source: 1C91168-06**		Prepared: 03/19/19 Analyzed: 03/20/19						
Arsenic, total	0.0952		mg/L	0.0800000	0.0257	86.9	80-120			

Certified Analyses Included in This Report

Method/Matrix	Analyte	Certifications
EPA 6020A in Water		
	Arsenic, total	SIA1X,KS-NT

Code	Certifying Authority	Certificate Number	Expires
KS-KC	Kansas Department of Health and Environment-KC	E-10110	04/30/2019
KS-NT	Kansas Department of Health and Environment (NELAP	E-10287	10/31/2019
MO-KC	Missouri Department of Natural Resources	140	04/30/2019
SIA1X	Iowa Department of Natural Resources	95	02/01/2019

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

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GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Bemis Project Number: SSOW 11111346-001 Project Manager: Kevin Armstrong	Reported 03/22/19 13:10

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

GHD-DSM 11228 Aurora Ave Des Moines, IA 50322	Project: Project Number: Project Manager:	Bemis SSOW 11111346-001 Kevin Armstrong	Reported 03/22/19 13:10

Leslie Taylor

Leslie Taylor

Project Manager I

The results in this report apply to the samples analyzed in accordance with the Chain-of-Custody record. This report must be reproduced in its entirety.

Phone 641-792-8451

600 East 17th Street South
Newton, IA 50208

Fax 641-792-7989

Appendix D
Statistical Evaluation Outputs

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.14/18/2019 4:02:45 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

MW-3

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	0.13	Mean	0.169
Maximum	0.217	Median	0.173
SD	0.0303	Std. Error of Mean	0.0107
Coefficient of Variation	0.179	Skewness	0.0536

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.19	95% Adjusted-CLT UCL (Chen-1995)	0.187
		95% Modified-t UCL (Johnson-1978)	0.19

Gamma GOF Test

A-D Test Statistic	0.26	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.715	tected data appear Gamma Distributed at 5% Significance Lev
K-S Test Statistic	0.17	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.294	tected data appear Gamma Distributed at 5% Significance Lev

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	35.1	k star (bias corrected MLE)	22.02
Theta hat (MLE)	0.00483	Theta star (bias corrected MLE)	0.00769
nu hat (MLE)	561.6	nu star (bias corrected)	352.3
MLE Mean (bias corrected)	0.169	MLE Sd (bias corrected)	0.0361
		Approximate Chi Square Value (0.05)	309.8
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	299.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.193	95% Adjusted Gamma UCL (use when n<50)	0.199

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.04	Mean of logged Data	-1.79
Maximum of Logged Data	-1.528	SD of logged Data	0.182

Assuming Lognormal Distribution

95% H-UCL	0.194	90% Chebyshev (MVUE) UCL	0.202
95% Chebyshev (MVUE) UCL	0.217	97.5% Chebyshev (MVUE) UCL	0.238
99% Chebyshev (MVUE) UCL	0.278		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.187	95% Jackknife UCL	0.19
95% Standard Bootstrap UCL	0.186	95% Bootstrap-t UCL	0.19
95% Hall's Bootstrap UCL	0.189	95% Percentile Bootstrap UCL	0.186
95% BCA Bootstrap UCL	0.185		
90% Chebyshev(Mean, Sd) UCL	0.201	95% Chebyshev(Mean, Sd) UCL	0.216
97.5% Chebyshev(Mean, Sd) UCL	0.236	99% Chebyshev(Mean, Sd) UCL	0.276

Suggested UCL to Use

95% Student's-t UCL	0.19

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

MW-10A

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.0082	Mean	0.0277
Maximum	0.0481	Median	0.0284
SD	0.012	Std. Error of Mean	0.00423
Coefficient of Variation	0.431	Skewness	0.126

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.0357	95% Adjusted-CLT UCL (Chen-1995)	0.0349
		95% Modified-t UCL (Johnson-1978)	0.0358

Gamma GOF Test

A-D Test Statistic	0.304	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.719	tected data appear Gamma Distributed at 5% Significance Lev
K-S Test Statistic	0.192	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.295	tected data appear Gamma Distributed at 5% Significance Lev

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.952	k star (bias corrected MLE)	3.179
Theta hat (MLE)	0.0056	Theta star (bias corrected MLE)	0.00872
nu hat (MLE)	79.24	nu star (bias corrected)	50.86
MLE Mean (bias corrected)	0.0277	MLE Sd (bias corrected)	0.0156
		Approximate Chi Square Value (0.05)	35.48
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	32.26

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.0397	95% Adjusted Gamma UCL (use when n<50)	0.0437

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.234	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.804	Mean of logged Data	-3.69
Maximum of Logged Data	-3.034	SD of logged Data	0.532

Assuming Lognormal Distribution

95% H-UCL	0.0467	90% Chebyshev (MVUE) UCL	0.0443
95% Chebyshev (MVUE) UCL	0.0516	97.5% Chebyshev (MVUE) UCL	0.0617
99% Chebyshev (MVUE) UCL	0.0816		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0347	95% Jackknife UCL	0.0357
95% Standard Bootstrap UCL	0.0343	95% Bootstrap-t UCL	0.0361
95% Hall's Bootstrap UCL	0.0367	95% Percentile Bootstrap UCL	0.0345
95% BCA Bootstrap UCL	0.0345		
90% Chebyshev(Mean, Sd) UCL	0.0404	95% Chebyshev(Mean, Sd) UCL	0.0462
97.5% Chebyshev(Mean, Sd) UCL	0.0541	99% Chebyshev(Mean, Sd) UCL	0.0698

Suggested UCL to Use

95% Student's-t UCL	0.0357

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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