HALEY ALDRICH

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2018 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

BOTTOM ASH SETTLING AREA /BOTTOM ASH LANDFILL
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Westar Energy, Inc.
Topeka, Kansas

File No. 129778-018
January 2019

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Revision No.	Date	Notes

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This Annual Groundwater Monitoring and Corrective Action Report documents the groundwater monitoring system for the Jeffrey Energy Center (JEC) Bottom Ash Settling Area/Bottom Ash Landfill (BASA/BAL) consistent with applicable sections of § 257.90 through 257.98, and describes activities conducted in the prior calendar year (2018) and documents compliance with the United States Environmental Protection Agency Coal Combustion Residual Rule. I certify that the 2018 Annual Groundwater Monitoring and Corrective Action Report for the JEC BASA/BAL is, to the best of my knowledge, accurate and complete.

Signed: _____
Professional Geologist

Print Name:	Mark Nicholls
Kansas License No.:	Professional Geologist No. 881
Title:	Technical Expert 2
Company:	Haley & Aldrich, Inc.

Mark Nicholls
Digitally signed by Mark Nicholls
Date: 2019.01.31 13:25:38 -07'00'

1. Introduction

This 2018 Annual Groundwater Monitoring and Corrective Action Report (Annual Report) addresses the Bottom Ash Settling Area/Bottom Ash Landfill (BASA/BAL) at the Jeffrey Energy Center (JEC), operated by Westar Energy, Inc. (Westar). This Annual Report was developed in accordance with the United States Environmental Protection Agency Coal Combustion Residual (CCR) Rule effective 19 October 2015 (Rule), specifically Code of Federal Regulations Title 40 (40 CFR), subsection § 257.90(e). The Annual Report documents the groundwater monitoring system for the BASA/BAL consistent with applicable sections of § 257.90 through 257.98, and describes activities conducted in the prior calendar year (2018) and documents compliance with the Rule. The specific requirements for the Annual Report listed in § 257.90(e) of the Rule are provided in Section 2 of this Annual Report and are in bold italic font, followed by a short narrative describing how each Rule requirement has been met.

2. 40 CFR § 257.90 Applicability

2.1 40 CFR § 257.90(a)

Except as provided for in §257.100 for inactive CCR surface impoundments, all CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under §257.90 through 257.98.

Westar has installed and certified a groundwater monitoring system at the JEC BASA/BAL. The BASA/BAL is a multi-unit system subject to the groundwater monitoring and corrective action requirements described under 40 CFR § 257.90 through 257.98. This document addresses the requirement for the Owner/Operator to prepare an Annual Report per § 257.90(e) (Rule).

2.2 40 CFR § 257.90(e) – SUMMARY

Annual groundwater monitoring and corrective action report. For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by §257.105(h)(1).

This Annual Report describes monitoring completed and actions taken for the groundwater monitoring system at the JEC BASA/BAL as required by the Rule. Groundwater sampling and analysis was conducted in accordance with requirements described in § 257.93, and the status of the groundwater monitoring program described in § 257.94 is provided in this report. This Annual Report documents the applicable groundwater-related activities completed in the calendar year 2018.

2.2.1 Status of the Groundwater Monitoring Program

Statistical analyses of detection monitoring data completed in 2018 indicated no Appendix III statistically significant increases (SSIs) at the BASA/BAL. The BASA/BAL remains in the detection monitoring program.

2.2.2 Key Actions Completed

The 2017 Annual Groundwater Monitoring and Corrective Action Report was completed in January 2018. Statistical analysis was completed in January 2018 on analytical data from the

initial detection monitoring sampling event. The statistical analyses indicated no SSIs for Appendix III constituents. Sampling for the first semi-annual detection monitoring event was completed in March 2018. Statistical analysis was completed within 90 days of receipt of finalized laboratory data. No SSIs were determined for this sampling event. Sampling for the second semi-annual detection monitoring event was completed in September 2018. Statistical analysis of the results from the second semi-annual detection monitoring sampling event are due to be completed in January 2019 and will be reported in the next annual report.

2.2.3 Problems Encountered

No noteworthy problems (i.e. problems could include damaged wells, Issues with sample collection or lack of sampling, and problems with analytical analysis) were encountered at the JEC BASA/BAL in 2018.

2.2.4 Actions to Resolve Problems

No problems were encountered at the JEC BASA/BAL in 2018, therefore, no actions to resolve the problems were required.

2.2.5 Project Key Activities for Upcoming Year

Key activities planned for 2019 include the 2018 Annual Groundwater Monitoring and Corrective Action Report, statistical analysis of detection monitoring analytical data collected in September 2018, and semi-annual detection monitoring and subsequent statistical analysis.

2.3 40 CFR § 257.90(e) – INFORMATION

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

2.3.1 40 CFR § 257.90(e)(1)

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

As required by § 257.90(e)(1), a map showing the locations of the CCR unit and associated upgradient and downgradient monitoring wells for the BASA/BAL is included in this report as Figure 1.

2.3.2 40 CFR § 257.90(e)(2) – Monitoring System Changes

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

No monitoring wells were installed or decommissioned during in 2018.

2.3.3 40 CFR § 257.90(e)(3) – Summary of Sampling Events

In addition to all the monitoring data obtained under §257.90 through §257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

In accordance with § 257.94(b), two independent detection monitoring samples from each background and downgradient monitoring well were collected during 2018. A summary table including the sample names, dates of sample collection, and monitoring data obtained for the groundwater monitoring program for the BASA/BAL is presented in Table I of this report.

2.3.4 40 CFR § 257.90(e)(4) – Monitoring Transition Narrative

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

Initial detection monitoring statistical analyses were completed in January 2018, in accordance with § 257.94(b). The analyte concentrations from the downgradient wells for each of the Appendix III constituents from the 2017 detection monitoring sampling event from each location were compared to their respective predicative limit (PL). Once data is validated, a sample concentration greater than the PL is considered to represent a SSI over background. The statistical analyses indicated no SSIs for Appendix III constituents.

2.3.5 40 CFR § 257.90(e)(5) – Other Requirements

Other information required to be included in the annual report as specified in §257.90 through §257.98.

This Annual Report documents activities conducted to comply with § 257.90 through § 257.95 of the Rule. It is understood that there are supplemental references in § 257.90 through § 257.98 to information that must be placed in the Annual Report. The following requirements include relevant and required information in the Annual Report for the activities completed in calendar year 2018.

2.3.5.1 40 CFR § 257.94(d)(3) – Demonstration for Alternative Detection Monitoring Frequency

The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).

An alternative groundwater detection monitoring sampling and analysis frequency has not been established for this CCR unit; therefore, no demonstration or certification is applicable.

2.3.5.2 40 CFR § 257.94(e)(2) – Detection Monitoring Alternate Source Demonstration

The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under this section. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

No Appendix III SSIs were indicated by statistical analyses completed in 2018, consequently, no alternative source demonstration or certification is applicable.

2.3.5.3 40 CFR § 257.95(c)(3) – Demonstration for Alternative Assessment Monitoring Frequency

The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).

The BASA/BAL remains in detection monitoring and an alternative groundwater assessment monitoring sampling and analysis frequency has not been established for this CCR unit; therefore, no demonstration or certification is applicable.

2.3.5.4 40 CFR § 257.95(d)(3) – Assessment Monitoring Concentrations and Groundwater Protection Standards

Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

The BASA/BAL has not transitioned into assessment monitoring, and no assessment monitoring samples were collected or analyzed in 2018. Consequently, Westar is not required to establish groundwater protection standards for this CCR unit and this criterion is not applicable.

2.3.5.5 40 CFR § 257.95(g)(3)(ii) – Assessment Monitoring Alternate Source Demonstration

Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority. If a successful demonstration is made, the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this section and may return to detection monitoring if the constituents in appendices III and IV to this part are at or below background as specified in paragraph (e) of this section. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

Assessment monitoring statistical analyses were not required or completed in 2018. Therefore, this criterion is not applicable.

2.3.5.6 40 CFR § 257.96(a) – Demonstration for Additional Time for Assessment of Corrective Measures

Within 90 days of finding that any constituent listed in appendix IV to this part has been detected at a statistically significant level exceeding the groundwater protection standard defined under § 257.95(h), or immediately upon detection of a release from a CCR unit, the owner or operator must initiate an assessment of corrective measures to prevent further releases, to remediate any releases and to restore affected area to original conditions. The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for no longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

Assessment monitoring statistical analyses were not required or completed in 2018. Therefore, this criterion is not applicable.

TABLE

TABLE I
SUMMARY OF ANALYTICAL RESULTS - DETECTION MONITORING
WESTAR ENERGY, INC.
JEFFREY ENERGY CENTER
BOTTOM ASH SETTLING AREA/BOTTOM ASH LANDFILL
ST. MARYS, KANSAS

Location	Upgradient		Downgradient					
	MW-BAA-6		MW-BAA-2		MW-BAA-3		MW-BAA-7	
Measure Point (TOC)	1301.81		1226.56		1222.00		1213.15	
Sample Name	BAA-6-031318	BAA-6-091218	BAA-2-031318	BAA-2-091218	BAA-3-031318	BAA-3-091218	BAA-7-031318	BAA-7-091218
Sample Date	3/13/2018	9/12/2018	3/13/2018	9/12/2018	3/13/2018	9/12/2018	3/13/2018	9/12/2018
Lab Data Reviewed and Accepted	4/16/2018	10/15/2018	4/16/2018	10/15/2018	4/16/2018	10/15/2018	4/16/2018	10/15/2018
Depth to Water (ft btoc)	80.00	78.67	14.94	15.52	15.43	12.79	18.88	19.81
Temperature (Deg C)	50.40	17.50	56.80	20.04	51.90	18.56	56.00	18.91
Conductivity (µS/cm)	3554	4100	1087	2270	3235	3430	2239	2280
Turbidity (NTU)	1.50	0.53	0.73	0.09	2.09	0.91	0.64	0.14
Boron, Total (mg/L)	**4.6**	**5.9**	**0.72**	**1.38**	**2.2**	**2.3**	**0.90**	**0.837**
Calcium, Total (mg/L)	**513**	**490**	**135**	**214**	**506**	**487**	**216**	**208**
Chloride (mg/L)	**252**	**314**	**70.0**	**220**	**149**	**172**	**194**	**211**
Fluoride (mg/L)	**0.43**	**0.79**	**0.57**	**0.63**	**0.72**	**0.92**	**0.77**	**0.79**
Sulfate (mg/L)	**2120**	**2190**	**387**	**983**	**1940**	**2170**	**914**	**914**
pH (su)	**7.0**	**7.1**	**7.4**	**8.5**	**7.2**	**6.9**	**7.5**	**7.4**
TDS (mg/L)	**3570**	**3630**	**949**	**1790**	**3330**	**3430**	**1800**	**1800**

Notes:

µ*S/cm = micro Siemens per centimeter*

ft btoc = feet below top of casing

Deg C = degrees Celsius

mg/L = milligrams per liter

NTU = Nephelometric Turbidity Unit

su = standard unit

TDS = total dissolved solids

TOC = top of casing

Bold value: Detection above laboratory reporting limit

FIGURE

LEGEND

- MONITORING WELL
- PIEZOMETRIC OBSERVATION ONLY
- BOTTOM ASH SETTLING AREA / BOTTOM ASH LANDFILL

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 250 500
SCALE IN FEET

HALEY ALDRICH

WESTAR ENERGY
JEFFREY ENERGY CENTER
ST. MARY'S, KANSAS

BOTTOM ASH SETTLING AREA / BOTTOM ASH LANDFILL MONITORING WELL LOCATION MAP

JANUARY 2019

FIGURE 1

GIS FILE PATH: G:\Projects\WestarJeffrey Energy Center (JEC)\GIS\MXDs\2018_01\JEC_BOTTOM ASH_AREA1_MW_LOCATION_MAP_REV2.mxd — USER: DZinsmaster — LAST SAVED: 1/24/2019 3:04:48 PM

HALEY & ALDRICH, INC.
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Suite 200
Cleveland, OH 44131
216.739.0555

Mark Nicholls
Digitally signed by Mark Nicholls
Date: 2022.11.04 10:53:35 -07'00'

November 3, 2022
Project No. 0204993-000

TO: Evergy Kansas Central, Inc.
Jared Morrison – Director, Water and Waste Programs

FROM: Haley & Aldrich, Inc.
Steven F. Putrich, P.E., Principal Consultant – Engineering Principal
Mark Nicholls, P.G., Senior Associate – Senior Hydrogeologist

SUBJECT: 2018 Annual Groundwater Monitoring and Corrective Action Report Addendum
Evergy Kansas Central, Inc.
Jeffrey Energy Center
Bottom Ash Settling Area/Bottom Ash Landfill

The Evergy Kansas Central, Inc. (Evergy) Bottom Ash Settling Area/Bottom Ash Landfill (BASA/BAL) at the Jeffrey Energy Center is subject to the groundwater monitoring and corrective action requirements described under Title 40 Code of Federal Regulations (40 CFR) §257.90 through §257.98 (Rule). An Annual Groundwater Monitoring and Corrective Action (GWMCA) Report documenting the activities completed in 2018 for the BASA/BAL was completed and placed in the facility's operating record on January 31, 2019, as required by the Rule. The Annual GWMCA Report contained the specific information listed in 40 CFR §257.90(e).

This report addendum has been prepared to supplement the operating record in recognition of comments received by Evergy from the U.S. Environmental Protection Agency (USEPA) on January 11, 2022. In addition to the information listed in 40 CFR §257.90(e), the USEPA indicated in their comments that the GWMCA Report should contain:

- Results of laboratory analysis of groundwater or other environmental media samples for the presence of constituents of Appendices III and IV to 40 CFR Part 257 (or of other constituents, such as those supporting characterization of site conditions that may ultimately affect a remedy);
- Required statistical analyses performed on those (laboratory analysis) results;
- Measured groundwater elevations; and
- Calculated groundwater flow rate and direction.

While this information is not specifically referred to in 40 CFR §257.90(e) for inclusion in the GWMCA Report, it has been routinely collected and maintained in Evergy's files and is being provided in the attachments to this addendum. The applicable laboratory analysis reports for 2018 sampling events are included in Attachment 1, and a discussion of the applicable statistical analyses completed in 2018 are included in Attachment 2 of this addendum. For each of the 2018 sampling events, the measured groundwater elevations, with calculated groundwater flow rates and directions, have been included in Attachment 3.

The Attachments to this addendum are described below:

- Attachment 1 – Laboratory Analytical Reports: Includes laboratory data packages with supporting information such as case narrative, sample and method summary, analytical results, quality control, and chain-of-custody documentation. The laboratory data packages for the sampling events completed in March and September 2018 are provided.
- Attachment 2 – Statistical Analyses: Includes a discussion of the statistical analyses utilized along with a table summarizing the statistical outputs (e.g., frequency of detection, maximum detection, variance, standard deviation, coefficient of variance, outlier tests, trends, upper and lower confidence limits, and comparison against Groundwater Protection Standards), and supporting backup for statistical analyses completed in 2018. Statistical analyses completed in 2018 included:
  - Overview of the January 2018 statistical analyses for data obtained in the August 2016 through August 2017 baseline sampling events; and
  - Overview of the July 2018 statistical analyses for data obtained in the March 2018 sampling event.
- Attachment 3 – Groundwater Potentiometric Maps: Includes the measured groundwater elevations at each well and the generalized groundwater flow direction and calculated flow rate. Maps for the sampling events completed in March and September 2018 are provided.

ATTACHMENT 1
Laboratory Analytical Reports

ATTACHMENT 1-1
March 2018 Sampling Event
Laboratory Analytical Report

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

June 26, 2018

Brandon Griffin
Westar Energy
818 S. Kansas Ave
Topeka, KS 66612

RE: Project: JEC BAA CCR
Pace Project No.: 60266064

Dear Brandon Griffin:
Enclosed are the analytical results for sample(s) received by the laboratory on March 16, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Revised Report_rev.1 Per the client's request, the 300.0 Fluoride result was re-evaluated. During the review, the lab found that there was a tail on the fluoride peak that caused a high bias. The new result has been reported.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather Wilson
heather.wilson@pacelabs.com
1(913)563-1407
Project Manager

Enclosures

cc: Andrew Hare, Westar Energy
Adam Kneeling, Haley & Aldrich, Inc.
JARED MORRISON, WESTAR ENERGY
Melissa Michels, Westar Energy

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: JEC BAA CCR
Pace Project No.: 60266064

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
WY STR Certification #: 2456.01
Arkansas Certification #: 17-016-0
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: JEC BAA CCR
Pace Project No.: 60266064

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60266064001	**BAA-6-031318**	Water	03/13/18 09:25	03/16/18 06:20
60266064002	**BAA-3-031318**	Water	03/13/18 10:18	03/16/18 06:20
60266064003	**BAA-2-031318**	Water	03/13/18 11:19	03/16/18 06:20
60266064004	**BAA-7-031318**	Water	03/13/18 12:02	03/16/18 06:20

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: JEC BAA CCR
Pace Project No.: 60266064

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60266064001	**BAA-6-031318**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	OL	1	PASI-K
		SM 4500-H+B	MJK	1	PASI-K
		EPA 300.0	AGO	3	PASI-K
60266064002	**BAA-3-031318**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	OL	1	PASI-K
		SM 4500-H+B	MJK	1	PASI-K
		EPA 300.0	AGO	3	PASI-K
60266064003	**BAA-2-031318**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	OL	1	PASI-K
		SM 4500-H+B	MJK	1	PASI-K
		EPA 300.0	AGO	3	PASI-K
60266064004	**BAA-7-031318**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	OL	1	PASI-K
		SM 4500-H+B	MJK	1	PASI-K
		EPA 300.0	AGO	3	PASI-K

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PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60266064

Method: **EPA 200.7**
Description: 200.7 Metals, Total
Client: WESTAR ENERGY
Date: June 26, 2018

General Information:
4 samples were analyzed for EPA 200.7. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 200.7 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 518080

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60265826001,60265958001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 2120634)
  - Calcium

Additional Comments:

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60266064

Method: **SM 2540C**
Description: 2540C Total Dissolved Solids
Client: WESTAR ENERGY
Date: June 26, 2018

General Information:
4 samples were analyzed for SM 2540C. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60266064

Method: **SM 4500-H+B**
Description: 4500H+ pH, Electrometric
Client: WESTAR ENERGY
Date: June 26, 2018

General Information:
4 samples were analyzed for SM 4500-H+B. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

H6: Analysis initiated outside of the 15 minute EPA required holding time.
- BAA-2-031318 (Lab ID: 60266064003)
- BAA-3-031318 (Lab ID: 60266064002)
- BAA-6-031318 (Lab ID: 60266064001)
- BAA-7-031318 (Lab ID: 60266064004)

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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(913)599-5665

PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60266064

Method: **EPA 300.0**
Description: 300.0 IC Anions 28 Days
Client: WESTAR ENERGY
Date: June 26, 2018

General Information:
4 samples were analyzed for EPA 300.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60266064

Sample: BAA-6-031318 **Lab ID: 60266064001** Collected: 03/13/18 09:25 Received: 03/16/18 06:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**4.6**	mg/L	0.10	1	03/19/18 12:55	03/21/18 16:08	7440-42-8	
Calcium, Total Recoverable	**513**	mg/L	0.20	1	03/19/18 12:55	03/21/18 16:08	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**3570**	mg/L	5.0	1		03/17/18 12:16		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.0**	Std. Units	0.10	1		03/20/18 10:45		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**252**	mg/L	50.0	50		03/21/18 22:39	16887-00-6	
Fluoride	**0.43**	mg/L	0.20	1		03/20/18 21:56	16984-48-8	
Sulfate	**2120**	mg/L	500	500		03/21/18 22:54	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60266064

Sample: BAA-3-031318 **Lab ID: 60266064002** Collected: 03/13/18 10:18 Received: 03/16/18 06:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**2.2**	mg/L	0.10	1	03/19/18 12:55	03/21/18 16:10	7440-42-8	
Calcium, Total Recoverable	**506**	mg/L	0.20	1	03/19/18 12:55	03/21/18 16:10	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**3330**	mg/L	5.0	1		03/17/18 12:17		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.2**	Std. Units	0.10	1		03/20/18 10:48		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**149**	mg/L	20.0	20		03/21/18 23:10	16887-00-6	
Fluoride	**0.72**	mg/L	0.20	1		03/20/18 22:10	16984-48-8	
Sulfate	**1940**	mg/L	500	500		03/21/18 23:25	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60266064

Sample: BAA-2-031318 **Lab ID: 60266064003** Collected: 03/13/18 11:19 Received: 03/16/18 06:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**0.72**	mg/L	0.10	1	03/19/18 12:55	03/21/18 16:13	7440-42-8	
Calcium, Total Recoverable	**135**	mg/L	0.20	1	03/19/18 12:55	03/21/18 16:13	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**949**	mg/L	5.0	1		03/17/18 12:17		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.4**	Std. Units	0.10	1		03/20/18 10:51		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**70.0**	mg/L	10.0	10		03/21/18 23:40	16887-00-6	
Fluoride	**0.57**	mg/L	0.20	1		03/20/18 22:23	16984-48-8	
Sulfate	**387**	mg/L	50.0	50		03/21/18 23:56	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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(913)599-5665

ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60266064

Sample: BAA-7-031318 **Lab ID: 60266064004** Collected: 03/13/18 12:02 Received: 03/16/18 06:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**0.90**	mg/L	0.10	1	03/19/18 12:55	03/21/18 16:15	7440-42-8	
Calcium, Total Recoverable	**216**	mg/L	0.20	1	03/19/18 12:55	03/21/18 16:15	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1800**	mg/L	5.0	1		03/17/18 12:17		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.5**	Std. Units	0.10	1		03/20/18 10:53		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**194**	mg/L	25.0	25		03/22/18 00:42	16887-00-6	
Fluoride	**0.77**	mg/L	0.20	1		03/20/18 22:37	16984-48-8	
Sulfate	**914**	mg/L	200	200		03/22/18 00:57	14808-79-8	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60266064

QC Batch: 518080 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

METHOD BLANK: 2120630 Matrix: Water
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	mg/L	<0.10	0.10	03/21/18 15:34	
Calcium	mg/L	<0.20	0.20	03/21/18 15:34	

LABORATORY CONTROL SAMPLE: 2120631

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	mg/L	1	0.93	93	85-115	
Calcium	mg/L	10	9.8	98	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2120632 2120633

Parameter	Units	60265826001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	mg/L	ND	1	1	0.95	0.97	94	95	70-130	2	20	
Calcium	mg/L	35300 ug/L	10	10	44.2	45.8	88	105	70-130	4	20	

MATRIX SPIKE SAMPLE: 2120634

Parameter	Units	60265958001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Boron	mg/L	367 ug/L	1	1.4	99	70-130	
Calcium	mg/L	139000 ug/L	10	153	135	70-130	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60266064

QC Batch: 518013 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

METHOD BLANK: 2120266 Matrix: Water
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	03/17/18 12:10	

LABORATORY CONTROL SAMPLE: 2120267

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	976	98	80-120	

SAMPLE DUPLICATE: 2120268

Parameter	Units	60265785007 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	320	302	6	10	

SAMPLE DUPLICATE: 2120269

Parameter	Units	60266066001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	491	520	6	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60266064

QC Batch: 518259 Analysis Method: SM 4500-H+B
QC Batch Method: SM 4500-H+B Analysis Description: 4500H+B pH
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

SAMPLE DUPLICATE: 2121548

Parameter	Units	60265693002 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	8.4	8.4	1	5	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60266064

QC Batch: 518423 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

METHOD BLANK: 2122026 Matrix: Water
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Fluoride	mg/L	<0.20	0.20	03/20/18 16:00	

LABORATORY CONTROL SAMPLE: 2122027

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Fluoride	mg/L	2.5	2.4	96	90-110	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60266064

QC Batch: 518518 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

METHOD BLANK: 2122415 Matrix: Water
Associated Lab Samples: 60266064001, 60266064002, 60266064003, 60266064004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<1.0	1.0	03/21/18 15:52	
Sulfate	mg/L	<1.0	1.0	03/21/18 15:52	

LABORATORY CONTROL SAMPLE: 2122416

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.9	98	90-110	
Sulfate	mg/L	5	5.3	106	90-110	

MATRIX SPIKE SAMPLE: 2122417

Parameter	Units	60266231002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	995	500	1560	112	80-120	
Sulfate	mg/L	ND	500	573	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2122418 2122419

Parameter	Units	60265987001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	ND	2500	2500	2760	2780	95	97	80-120	1	15	
Sulfate	mg/L	3610	2500	2500	6180	6250	103	106	80-120	1	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: JEC BAA CCR
Pace Project No.: 60266064

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: JEC BAA CCR
Pace Project No.: 60266064

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60266064001	**BAA-6-031318**	EPA 200.7	518080	EPA 200.7	518152
60266064002	**BAA-3-031318**	EPA 200.7	518080	EPA 200.7	518152
60266064003	**BAA-2-031318**	EPA 200.7	518080	EPA 200.7	518152
60266064004	**BAA-7-031318**	EPA 200.7	518080	EPA 200.7	518152
60266064001	**BAA-6-031318**	SM 2540C	518013		
60266064002	**BAA-3-031318**	SM 2540C	518013		
60266064003	**BAA-2-031318**	SM 2540C	518013		
60266064004	**BAA-7-031318**	SM 2540C	518013		
60266064001	**BAA-6-031318**	SM 4500-H+B	518259		
60266064002	**BAA-3-031318**	SM 4500-H+B	518259		
60266064003	**BAA-2-031318**	SM 4500-H+B	518259		
60266064004	**BAA-7-031318**	SM 4500-H+B	518259		
60266064001	**BAA-6-031318**	EPA 300.0	518423		
60266064001	**BAA-6-031318**	EPA 300.0	518518		
60266064002	**BAA-3-031318**	EPA 300.0	518423		
60266064002	**BAA-3-031318**	EPA 300.0	518518		
60266064003	**BAA-2-031318**	EPA 300.0	518423		
60266064003	**BAA-2-031318**	EPA 300.0	518518		
60266064004	**BAA-7-031318**	EPA 300.0	518423		
60266064004	**BAA-7-031318**	EPA 300.0	518518		

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Sample Condition Upon Receipt

WO# : 60266064

60266064

Client Name: Wester Energy

Courier: FedEx ☐ UPS ☐ VIA ☑ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other ☑ Zplc

Thermometer Used: _____ **Type of Ice:** Wet Blue None

Cooler Temperature (°C): **As-read** 0.7 **Corr. Factor** +0.2 **Corrected** 0.9

Date and initials of person examining contents: 3/16/18

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☑Yes ☐No ☐N/A	ph
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☑Yes ☐No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☑N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

REVIEWED
By hwilson at 4:51 pm, 3/16/18

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	WESTAR ENERGY	Report To:	Brandon Griffin	Attention:	
Address:	818 Kansas Ave	Copy To:	Jared Morrison	Company Name:	
	Topeka, KS 66612			Address:	
Email To:	brandon.l.griffin@westarenergy.com	Purchase Order No.:		Pace Quote Reference:	
Phone:	785-575-8135 Fax:	Project Name:	JEC BAA CCR	Pace Project Manager:	Jenalee Converse 913-563-1401
Requested Due Date/TAT:	7 day	Project Number:		Pace Profile #:	9657

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: KS

Requested Analysis Filtered (Y/N)

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

ITEM #	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	200.7 Total Metals*	300: Cl, F, SO4	2540C TDS	4500 H+B	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	BAA-6-031318	WT	G			3/13/18 0925		3	1		3							BP1N, 2 BP3N					01
2	BAA-3-031318	WT	G			3/13/18 1018		3	1		3												02
3	BAA-2-031318	WT	G			3/13/18 1119		3	1		3												03
4	BAA-7-031318	WT	G			3/13/18 1202		3	1		3												04
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

6026606 4

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
200.7 Total Metals*: B, Ca	Westar	3/14/18	1600	E Brocklett 1 Pcs:	3/16/18	0630	07	Y	Y	Y

SAMPLER NAME AND SIGNATURE			Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:	Brandon Griffin					
SIGNATURE of SAMPLER:		DATE Signed (MM/DD/YY): 03/13/18				

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.08, 12-Oct-2007

ATTACHMENT 1-2
September 2018 Sampling Event
Laboratory Analytical Report

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

September 24, 2018

Brandon Griffin
Westar Energy
818 S. Kansas Ave
Topeka, KS 66612

RE: Project: JEC BAA CCR
Pace Project No.: 60280688

Dear Brandon Griffin:
Enclosed are the analytical results for sample(s) received by the laboratory on September 14, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather Wilson
heather.wilson@pacelabs.com
1(913)563-1407
Project Manager

Enclosures

cc: HEATH HORYNA, WESTAR ENERGY
Andrew Hare, Westar Energy
Adam Kneeling, Haley & Aldrich, Inc.
JARED MORRISON, WESTAR ENERGY
Melissa Michels, Westar Energy

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CERTIFICATIONS

Project: JEC BAA CCR
Pace Project No.: 60280688

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
Arkansas Drinking Water
WY STR Certification #: 2456.01
Arkansas Certification #: 18-016-0
Arkansas Drinking Water
Illinois Certification #: 004455
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

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SAMPLE SUMMARY

Project: JEC BAA CCR
Pace Project No.: 60280688

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60280688001	**BAA-2-091218**	Water	09/12/18 14:09	09/14/18 16:20
60280688002	**BAA-3-091218**	Water	09/12/18 12:30	09/14/18 16:20
60280688003	**BAA-6-091218**	Water	09/12/18 11:32	09/14/18 16:20
60280688004	**BAA-7-091218**	Water	09/12/18 15:03	09/14/18 16:20
60280688005	**DUP-091218**	Water	09/12/18 06:00	09/14/18 16:20

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SAMPLE ANALYTE COUNT

Project: JEC BAA CCR
Pace Project No.: 60280688

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60280688001	**BAA-2-091218**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	JDA	1	PASI-K
		SM 4500-H+B	ZMH	1	PASI-K
		EPA 300.0	OL, WNM	3	PASI-K
60280688002	**BAA-3-091218**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	JDA	1	PASI-K
		SM 4500-H+B	ZMH	1	PASI-K
		EPA 300.0	OL, WNM	3	PASI-K
60280688003	**BAA-6-091218**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	JDA	1	PASI-K
		SM 4500-H+B	ZMH	1	PASI-K
		EPA 300.0	OL, WNM	3	PASI-K
60280688004	**BAA-7-091218**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	JDA	1	PASI-K
		SM 4500-H+B	ZMH	1	PASI-K
		EPA 300.0	OL, WNM	3	PASI-K
60280688005	**DUP-091218**	EPA 200.7	TDS	2	PASI-K
		SM 2540C	JDA	1	PASI-K
		SM 4500-H+B	ZMH	1	PASI-K
		EPA 300.0	OL, WNM	3	PASI-K

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PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60280688

Method: **EPA 200.7**
Description: 200.7 Metals, Total
Client: WESTAR ENERGY
Date: September 24, 2018

General Information:
5 samples were analyzed for EPA 200.7. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 200.7 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60280688

Method: **SM 2540C**
Description: 2540C Total Dissolved Solids
Client: WESTAR ENERGY
Date: September 24, 2018

General Information:
5 samples were analyzed for SM 2540C. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60280688

Method: **SM 4500-H+B**
Description: 4500H+ pH, Electrometric
Client: WESTAR ENERGY
Date: September 24, 2018

General Information:
5 samples were analyzed for SM 4500-H+B. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

H6: Analysis initiated outside of the 15 minute EPA required holding time.
- BAA-2-091218 (Lab ID: 60280688001)
- BAA-3-091218 (Lab ID: 60280688002)
- BAA-6-091218 (Lab ID: 60280688003)
- BAA-7-091218 (Lab ID: 60280688004)
- DUP-091218 (Lab ID: 60280688005)

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: JEC BAA CCR
Pace Project No.: 60280688

Method: **EPA 300.0**
Description: 300.0 IC Anions 28 Days
Client: WESTAR ENERGY
Date: September 24, 2018

General Information:
5 samples were analyzed for EPA 300.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60280688

Sample: BAA-2-091218 **Lab ID: 60280688001** Collected: 09/12/18 14:09 Received: 09/14/18 16:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**1380**	ug/L	100	1	09/18/18 09:42	09/20/18 11:55	7440-42-8	
Calcium, Total Recoverable	**214000**	ug/L	200	1	09/18/18 09:42	09/20/18 14:43	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1790**	mg/L	5.0	1		09/19/18 10:42		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**8.5**	Std. Units	0.10	1		09/17/18 12:09		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**220**	mg/L	20.0	20		09/24/18 10:11	16887-00-6	
Fluoride	**0.63**	mg/L	0.20	1		09/22/18 10:21	16984-48-8	
Sulfate	**983**	mg/L	100	100		09/23/18 09:46	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60280688

Sample: BAA-3-091218 **Lab ID: 60280688002** Collected: 09/12/18 12:30 Received: 09/14/18 16:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**2300**	ug/L	100	1	09/18/18 09:42	09/20/18 11:57	7440-42-8	
Calcium, Total Recoverable	**487000**	ug/L	200	1	09/18/18 09:42	09/20/18 14:45	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**3430**	mg/L	5.0	1		09/19/18 10:42		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**6.9**	Std. Units	0.10	1		09/17/18 12:08		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**172**	mg/L	10.0	10		09/24/18 11:00	16887-00-6	
Fluoride	**0.92**	mg/L	0.20	1		09/22/18 11:03	16984-48-8	
Sulfate	**2170**	mg/L	200	200		09/23/18 11:24	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60280688

Sample: BAA-6-091218 **Lab ID: 60280688003** Collected: 09/12/18 11:32 Received: 09/14/18 16:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**5920**	ug/L	100	1	09/18/18 09:42	09/20/18 12:00	7440-42-8	
Calcium, Total Recoverable	**490000**	ug/L	200	1	09/18/18 09:42	09/20/18 14:47	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**3630**	mg/L	5.0	1		09/19/18 10:42		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.1**	Std. Units	0.10	1		09/17/18 12:01		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**314**	mg/L	20.0	20		09/24/18 11:16	16887-00-6	
Fluoride	**0.79**	mg/L	0.20	1		09/22/18 11:32	16984-48-8	
Sulfate	**2190**	mg/L	200	200		09/23/18 11:57	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60280688

Sample: BAA-7-091218 **Lab ID: 60280688004** Collected: 09/12/18 15:03 Received: 09/14/18 16:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**837**	ug/L	100	1	09/18/18 09:42	09/20/18 12:02	7440-42-8	
Calcium, Total Recoverable	**208000**	ug/L	200	1	09/18/18 09:42	09/20/18 14:50	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**1800**	mg/L	5.0	1		09/19/18 10:42		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.4**	Std. Units	0.10	1		09/17/18 12:11		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**211**	mg/L	20.0	20		09/24/18 12:05	16887-00-6	
Fluoride	**0.79**	mg/L	0.20	1		09/22/18 12:43	16984-48-8	
Sulfate	**914**	mg/L	100	100		09/23/18 12:30	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: JEC BAA CCR
Pace Project No.: 60280688

Sample: DUP-091218 **Lab ID: 60280688005** Collected: 09/12/18 06:00 Received: 09/14/18 16:20 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Boron, Total Recoverable	**2270**	ug/L	100	1	09/18/18 09:42	09/20/18 12:04	7440-42-8	
Calcium, Total Recoverable	**512000**	ug/L	200	1	09/18/18 09:42	09/20/18 14:52	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C							
Total Dissolved Solids	**3650**	mg/L	5.0	1		09/19/18 10:42		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	**7.0**	Std. Units	0.10	1		09/17/18 11:49		H6
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0							
Chloride	**171**	mg/L	10.0	10		09/24/18 13:24	16887-00-6	
Fluoride	**0.90**	mg/L	0.20	1		09/22/18 12:57	16984-48-8	
Sulfate	**2210**	mg/L	200	200		09/23/18 13:02	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60280688

QC Batch: 544993 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

METHOD BLANK: 2233253 Matrix: Water
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	<100	100	09/20/18 11:49	
Calcium	ug/L	<200	200	09/20/18 14:38	

LABORATORY CONTROL SAMPLE: 2233254

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	1000	946	95	85-115	
Calcium	ug/L	10000	9070	91	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2233255 2233256

Parameter	Units	60280527001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	ND	1000	1000	994	1010	94	96	70-130	2	20	
Calcium	ug/L	6690	10000	10000	15800	15800	91	91	70-130	0	20	

MATRIX SPIKE SAMPLE: 2233257

Parameter	Units	60280628001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	ND	1000	950	94	70-130	
Calcium	ug/L	494	10000	9560	91	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60280688

QC Batch: 545230 Analysis Method: SM 2540C
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

METHOD BLANK: 2234165 Matrix: Water
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<5.0	5.0	09/19/18 10:42	

LABORATORY CONTROL SAMPLE: 2234166

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	1010	101	80-120	

SAMPLE DUPLICATE: 2234167

Parameter	Units	60280654007 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	483	479	1	10	

SAMPLE DUPLICATE: 2234168

Parameter	Units	60280607006 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	827	825	0	10	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60280688

QC Batch: 544850 Analysis Method: SM 4500-H+B
QC Batch Method: SM 4500-H+B Analysis Description: 4500H+B pH
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

SAMPLE DUPLICATE: 2232922

Parameter	Units	60280457001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	6.9	7.3	5	5	H6

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60280688

QC Batch: 545822 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

METHOD BLANK: 2237213 Matrix: Water
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Fluoride	mg/L	<0.20	0.20	09/22/18 09:52	

LABORATORY CONTROL SAMPLE: 2237214

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Fluoride	mg/L	2.5	2.4	95	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2237215 2237216

Parameter	Units	60280688001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Fluoride	mg/L	0.63	2.5	2.5	3.2	3.2	102	104	90-110	1	15	

MATRIX SPIKE SAMPLE: 2237217

Parameter	Units	60280688002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Fluoride	mg/L	0.92	2.5	3.5	105	90-110	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60280688

QC Batch: 545852 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

METHOD BLANK: 2237829 Matrix: Water
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	<1.0	1.0	09/23/18 07:59	

LABORATORY CONTROL SAMPLE: 2237830

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	5.0	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2237831 2237832

Parameter	Units	60280688001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	983	500	500	1520	1530	107	110	90-110	1	15	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: JEC BAA CCR
Pace Project No.: 60280688

QC Batch: 545886 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

METHOD BLANK: 2238132 Matrix: Water
Associated Lab Samples: 60280688001, 60280688002, 60280688003, 60280688004, 60280688005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<1.0	1.0	09/24/18 09:20	

LABORATORY CONTROL SAMPLE: 2238133

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.9	98	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2238134 2238135

Parameter	Units	60280688001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	220	100	100	331	330	110	109	90-110	0	15	

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REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: JEC BAA CCR
Pace Project No.: 60280688

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: JEC BAA CCR
Pace Project No.: 60280688

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60280688001	**BAA-2-091218**	EPA 200.7	544993	EPA 200.7	545063
60280688002	**BAA-3-091218**	EPA 200.7	544993	EPA 200.7	545063
60280688003	**BAA-6-091218**	EPA 200.7	544993	EPA 200.7	545063
60280688004	**BAA-7-091218**	EPA 200.7	544993	EPA 200.7	545063
60280688005	**DUP-091218**	EPA 200.7	544993	EPA 200.7	545063
60280688001	**BAA-2-091218**	SM 2540C	545230		
60280688002	**BAA-3-091218**	SM 2540C	545230		
60280688003	**BAA-6-091218**	SM 2540C	545230		
60280688004	**BAA-7-091218**	SM 2540C	545230		
60280688005	**DUP-091218**	SM 2540C	545230		
60280688001	**BAA-2-091218**	SM 4500-H+B	544850		
60280688002	**BAA-3-091218**	SM 4500-H+B	544850		
60280688003	**BAA-6-091218**	SM 4500-H+B	544850		
60280688004	**BAA-7-091218**	SM 4500-H+B	544850		
60280688005	**DUP-091218**	SM 4500-H+B	544850		
60280688001	**BAA-2-091218**	EPA 300.0	545822		
60280688001	**BAA-2-091218**	EPA 300.0	545852		
60280688001	**BAA-2-091218**	EPA 300.0	545886		
60280688002	**BAA-3-091218**	EPA 300.0	545822		
60280688002	**BAA-3-091218**	EPA 300.0	545852		
60280688002	**BAA-3-091218**	EPA 300.0	545886		
60280688003	**BAA-6-091218**	EPA 300.0	545822		
60280688003	**BAA-6-091218**	EPA 300.0	545852		
60280688003	**BAA-6-091218**	EPA 300.0	545886		
60280688004	**BAA-7-091218**	EPA 300.0	545822		
60280688004	**BAA-7-091218**	EPA 300.0	545852		
60280688004	**BAA-7-091218**	EPA 300.0	545886		
60280688005	**DUP-091218**	EPA 300.0	545822		
60280688005	**DUP-091218**	EPA 300.0	545852		
60280688005	**DUP-091218**	EPA 300.0	545886		

Pace Analytical
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Sample Condition Upon Receipt

WO# : 60280688

60280688

Client Name: Westar Energy

Courier: FedEx ☐ UPS ☐ VIA ☑ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☐ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☑ Other ☐

Thermometer Used: T-298 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): **As-read** 1.0 **Corr. Factor** 0.6 **Corrected** 1.0

Date and initials of person examining contents: JW 9/14/18

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☑Yes ☐No ☐N/A	pH
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State:	☐Yes ☐No ☑N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

HMW

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: REVIEWED By hwilson at 1:50 pm, 9/17/18 Date: _____

Pace Analytical
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A — **Required** Client Information:

Company:	WESTAR ENERGY
Address:	818 Kansas Ave
	Topeka, KS 66612
Email To:	brandon.l.griffin@westarenergy.com
Phone: (785) 575-8135	Fax:
Requested Due Date/TAT:	7 DAY

Section B — **Required** Project Information:

Report To:	Brandon Griffin
Copy To:	Jared Morrison,
Purchase Order No.:	10JEC-00000 33150
Project Name:	JEC BAA CCR
Project Number:	

Section C — Invoice Information:

Attention:	Jared Morrison
Company Name:	WESTAR ENERGY
Address:	SEE SECTION A
Pace Quote Reference:	
Pace Project Manager:	Heather Wilson, 913-563-1407
Pace Profile #:	9657, 4

REGULATORY AGENCY

☑ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: KS

Section D — **Required** Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N	Analysis Test: 200.7 Total Metals*	300.0: chloride, fluoride	300.0: sulfate	2540C: TDS	4500: pH	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 60290688
1	BAA-2-091218	WT	G			9/12	1409												X	X	X	X	X		001
2	BAA-3-091218	WT	G			9/12	1230		2	1		1							X	X	X	X	X		002
3	BAA-6-091218	WT	G			9/12	1132		2	1		1							X	X	X	X	X		003
4	BAA-7-091218	WT	G			9/12	1503												X	X	X	X	X		
5																									
6	DUP-091218	WT	G			9/12	0600		2	1		1							X	X	X	X	X		004
7																									
8																									
9																									
10																									
11																									
12																									

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
*200.7 Total Metals: B and Ca	Westar	9/13/18	0900	Pumpase	9/14	1620	1.0	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Brandon Griffin

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 09/12/18

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.08, 12-Oct-2007

ATTACHMENT 2
Statistical Analyses

ATTACHMENT 2-1
January 2018 Statistical Analyses

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

TECHNICAL MEMORANDUM

November 3, 2022
File No. 129778

TO: Evergy Kansas Central, Inc.
Jared Morrison – Director, Water and Waste Programs

FROM: Haley & Aldrich, Inc.
Steven F. Putrich, P.E., Senior Associate – Engineering Principal
Mark Nicholls, P.G., Senior Associate – Senior Hydrogeologist

SUBJECT: Background Groundwater Monitoring Data
Statistical Evaluation
Completed January 15, 2018
Jeffrey Energy Center
Bottom Ash Settling Area/Bottom Ash Landfill

Pursuant to Title 40 Code of Federal Regulations (40 CFR) § 257.90 (Rule), this memorandum summarizes the statistical evaluation of analytical results for the background monitoring groundwater sampling events for the Jeffrey Energy Center (JEC) Bottom Ash Settling Area/Bottom Ash Landfill (BASA/BAL). These background monitoring groundwater sampling events were completed from **August 2016 through August 2017,** with laboratory results received and accepted by **October 17, 2017**.

The statistical evaluation discussed in this memorandum was conducted to determine if Appendix III groundwater monitoring constituents have been detected in downgradient wells at concentrations that represent a statistically significant increase (SSI) above background or upgradient wells consistent with the requirements in 40 CFR § 257.94.

Statistical Evaluation of Appendix III Constituents

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residual (CCR) unit (40 CFR § 257.93(f) (1-4)). The two statistical methods used for these evaluations, prediction limits (PL) and Parametric Analysis of Variance (ANOVA), were certified by Haley & Aldrich, Inc. on January 15, 2018. The PL method, as determined applicable for this sampling event, was used to evaluate potential SSIs above background. Background levels for each constituent listed in Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids) were computed as upper prediction limits (UPL), considering one future observation, and a minimum 95 percent confidence coefficient. The entire data set for each compliance well was checked for the presence of outliers. If the presence of outliers was confirmed, then the outlier was removed from the

data set. After removing confirmed outliers, the entire data set was compared against the interwell background UPL to check for exceedances. Interwell evaluation compares the data points from downgradient compliance wells against a background data set composed of upgradient well data (MW-BAA-6). If all data points were below the background limit, then the well was excluded from further analysis. If more than two data points exceeded the background limit, then the data would be checked for seasonal influences and other significant differences using ANOVA, and SSIs were determined based on the most recent four rounds of the data distribution.

STATISTICAL EVALUATION

As documented in the statistical method certification, the Parametric ANOVA and PL methods were used to complete the statistical evaluation of the referenced data set. A PL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a specified confidence level (e.g., 95 percent). The upper endpoint of a concentration limit is called the UPL. Depending on the background data distribution, parametric or non-parametric PL procedures are used to evaluate groundwater monitoring data using this method. Parametric PLs utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the PL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UPL.

The ANOVA is a statistical procedure for comparing average concentration differences between one or more groups (e.g., wells). Depending on the background data distribution, parametric or non-parametric ANOVA procedures are used to evaluate groundwater monitoring data using this method. Parametric ANOVA assesses differences in means, and the non-parametric ANOVA compares median concentration levels. The method determines whether there are statistically significant differences in mean/median concentrations among a set of down-gradient wells relative to the background wells. In one-way ANOVA, the null hypothesis is that the groups under comparison have equal means and that any differences in the sample means are due to chance. The alternative hypothesis is stated as the means of the groups are not equal. The decision error, level (α) value shall comply with the performance criteria set forth in § 257.93(g)(2).

The statistical evaluation was conducted using the background data set for all Appendix III constituents. The UPLs were calculated from the background well data set using Chemstat software after testing for outlier sample results that would warrant removal from the data set based on likely error in sampling or measurement. Both visual and statistical outlier tests for the background data were performed using Chemstat and U.S. Environmental Protection Agency's ProUCL 5.1 software, and a visual inspection of the data was performed using box plots and distribution plots for the downgradient sample data. A pH result from MW-BAA-3 collected on August 26, 2016 and a sulfate result from MW-BAA-4 collected on November 3, 2016 were identified as outliers that warranted removal from the data set.

BACKGROUND DISTRIBUTIONS

The groundwater analytical results for each sampling event from the background sample location (MW-BAA-6) were combined to calculate the UPL for each Appendix III constituent. The variability and distribution of the pooled data set was evaluated to determine the method for UPL calculation. Per the document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*, March 2009, background concentrations were updated based on statistical evaluation of analytical results collected through **August 2017**.

RESULTS OF APPENDIX III DOWNGRADIENT STATISTICAL COMPARISONS

The entire background data set from the downgradient wells for each of the Appendix III constituents was compared to their respective background UPLs (Table I). A sample concentration greater than the background UPL is considered to represent an SSI. The results of the background groundwater monitoring statistical evaluation is provided in Table I. **Based on this statistical evaluation on groundwater sampling data collected from August 2016 through August 2017, no SSIs above background PLs occurred at the JEC BASA/BAL.**

Tables:
Table I – Summary of Background Groundwater Monitoring Statistical Evaluation

Revision No.	Date	Notes
0	January 2018	Original
1	September 2020	Update report to current Evergy Kansas Central, Inc. format

TABLE

TABLE I
SUMMARY OF BACKGROUND GROUNDWATER MONITORING STATISTICAL EVALUATION
BACKGROUND SAMPLING EVENTS (AUGUST 2016 - AUGUST 2017)
JEFFREY ENERGY CENTER - BOTTOM ASH SETTLING AREA/BOTTOM ASH LANDFILL
ST. MARYS, KANSAS

														Interwell Comparison
Location Id	**Frequency of Detection**			**Percent Non-Detects**	**Range of Non-Detects**			**Mean**	**Variance**	**Standard Deviation**	**Coefficient of Variation**	**Outlier Presence**	**Outlier Removed**	**Trend**	**Distribution Well**	**[2]Exceedance above Background at Individual Well**
APPENDIX III: Boron (mg/L)																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	3.388	1.48E+00	1.215	0.359	No	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	1.051	1.94E-02	0.139	0.132	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	2.263	1.13E-02	0.106	0.0469	No	No	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	1.199	3.26E-02	0.181	0.151	No	No	Stable	Parametric	No
APPENDIX III: Calcium (mg/L)																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	491.8	3.36E+03	57.92	0.118	Yes	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	182.6	4.41E+02	21	0.115	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	512.5	7.63E+02	27.63	0.0539	No	No	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	237.6	1.98E+02	14.07	0.0592	No	No	Stable	Parametric	No
APPENDIX III: Chloride (mg/L)																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	217.5	1.03E+03	32.1	0.148	No	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	125	5.29E+02	23	0.184	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	155.1	1.56E+01	3.944	0.0254	No	No	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	180.8	1.14E+03	33.7	0.186	Yes	No	Stable	Parametric	No
APPENDIX III: Fluoride (mg/L)																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	0.633	2.59E-02	0.161	0.254	No	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	0.498	1.82E-03	0.0427	0.0858	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	0.929	5.47E-03	0.074	0.0796	No	No	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	0.788	6.91E-03	0.0831	0.106	No	No	Stable	Parametric	No
APPENDIX III: Ph																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	7.038	2.27E-02	0.151	0.0214	No	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	7.388	1.27E-02	0.113	0.0152	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	7.2	3.43E-02	0.185	0.0257	Yes	Yes	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	7.325	1.07E-02	0.104	0.0141	No	No	Stable	Parametric	No
APPENDIX III: Sulfate (mg/L)																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	1733	8.17E+04	285.8	0.165	Yes	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	686.8	2.24E+04	149.8	0.218	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	2045	1.57E+04	125.5	0.0614	No	No	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	915.8	8.03E+02	28.33	0.0309	No	No	Stable	Parametric	No
APPENDIX III: Total Dissolved Solids (mg/L)																
MW-BAA-6 (Upgradient)	8	/	8	0%	N/A	:	N/A	3100	1.80E+05	424.7	0.137	Yes	No	Stable		
MW-BAA-2	8	/	8	0%	N/A	:	N/A	1284	1.74E+04	131.9	0.103	No	No	Stable	Parametric	No
MW-BAA-3	8	/	8	0%	N/A	:	N/A	3274	2.72E+04	165	0.0504	No	No	Stable	Parametric	No
MW-BAA-7	8	/	8	0%	N/A	:	N/A	1806	5.60E+03	74.82	0.0414	No	No	Stable	Parametric	No

Notes & Abbreviations:

** - Determined using the Shapiro-Wilks statistical test at a 1% significance level and a residual probability plot.*

1: The interwell group difference is determined by comparing the pooled down-gradient well dataset to the pooled up-gradient background well dataset using a parametric t-test or Wilcoxon rank-sum test.

2: Background exceedance at individual down-gradient well is determined by comparing to pooled up-gradient background well dataset using either Analysis of Variance (ANOVA) with multiple comparison or prediction limit methods at a 1% significance level.

3: Background exceedance at individual down-gradient well is determined by comparing to the historic background from the same well using either a parametric control chart or non-parametric prediction limit methods at a 1% significance level.

4: Exceedance above background is determined by evaluating the appropriate interwell or intrawell comparison exceedance.

% = percent

mg/L = milligrams per liter

N/A = not applicable

NT = not tested

SU = standard unit

ATTACHMENT 2-2
March 2018 Statistical Analysis

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

TECHNICAL MEMORANDUM

November 3, 2022
File No. 129778

TO: Evergy Kansas Central, Inc.
Jared Morrison – Director, Water and Waste Programs

FROM: Haley & Aldrich, Inc.
Steven F. Putrich, P.E., Senior Associate – Engineering Principal
Mark Nicholls, P.G., Senior Associate – Senior Hydrogeologist

SUBJECT: March 2018 Semi-Annual Groundwater Detection Monitoring Data
Statistical Evaluation
Completed July 16, 2018
Jeffrey Energy Center
Bottom Ash Settling Area/Bottom Ash Landfill

Pursuant to Title 40 Code of Federal Regulations (40 CFR) §§ 257.93 and 257.94 (Rule), this memorandum summarizes the statistical evaluation of the analytical results for the **March 2018** semi-annual detection monitoring groundwater sampling event for the Jeffrey Energy Center (JEC) Bottom Ash Settling Area/Bottom Ash Landfill (BASA/BAL). This semi-annual detection monitoring groundwater sampling event was completed on **March 13, 2018**, with laboratory results received and accepted on **April 16, 2018**.

The statistical evaluation discussed in this memorandum was conducted to determine if Appendix III groundwater monitoring constituents have been detected in downgradient wells at concentrations that represent a statistically significant increase (SSI) above background or upgradient wells consistent with the requirements in 40 CFR § 257.94.

Statistical Evaluation of Appendix III Constituents

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residual (CCR) unit (40 CFR § 257.93(f)(1-4)). The two statistical methods used for these evaluations, prediction limits (PLs) and Parametric Analysis of Variance, were certified by Haley & Aldrich, Inc. on October 17, 2017. The PL method, as determined applicable for this sampling event, was used to evaluate potential SSIs above background. Background levels for each constituent listed in Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids) were computed as upper prediction limits (UPL), considering one future observation, and a minimum 95 percent confidence coefficient. The most recent groundwater sampling event from each compliance well was compared to the corresponding background PL to determine if an SSI existed.

STATISTICAL ANALYSIS

An interwell evaluation using the PL method was used to complete the statistical evaluation of the referenced dataset. Interwell evaluation compares the most recent values from downgradient compliance wells against a background dataset composed of upgradient well data (MW-BAA-6). A PL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a specified confidence level (e.g., 95 percent). The upper endpoint of a concentration limit is called the UPL. Depending on the background data distribution, parametric or non-parametric PL procedures are used to evaluate groundwater monitoring data using this method. Parametric PLs utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the PL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UPL.

The statistical evaluation was conducted using the background dataset for all Appendix III constituents. The UPLs were calculated from the background well dataset using Chemstat software after testing for outlier sample results that would warrant removal from the dataset based on likely error in sampling or measurement. Both visual and statistical outlier tests for the background data were performed using Chemstat and U.S. Environmental Protection Agency's ProUCL 5.1 software, and a visual inspection of the data was performed using box plots and distribution plots for the downgradient sample data. No sample data were identified as outliers that warranted removal from the dataset.

BACKGROUND DISTRIBUTIONS

The groundwater analytical results for each sampling event from the background sample location MW-BAA-6 were combined to calculate the UPL for each Appendix III constituent. The variability and distribution of the pooled dataset were evaluated to determine the method for UPL calculation. Per the document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*, March 2009, background concentrations were updated based on statistical evaluation of analytical results collected through **June 2017**.

RESULTS OF APPENDIX III DOWNGRADIENT STATISTICAL COMPARISONS

Sample concentrations from the downgradient wells for each of the Appendix III constituents from the **March 2018** semi-annual detection monitoring sampling event were compared to their respective background UPLs (Table I). A sample concentration greater than the background UPL is considered to represent a SSI. The results of the groundwater detection monitoring statistical evaluation are provided in Table I. **Based on this statistical evaluation of groundwater sampling data collected in March 2018, no SSIs above background PLs occurred at the JEC BASA/BAL.**

Enclosures:

Table I – March 2018 Detection Monitoring Statistical Analysis Summary

TABLE

TABLE I
SUMMARY OF SEMI-ANNUAL DETECTION GROUNDWATER MONITORING STATISTICAL EVALUATION
MARCH 2018 SAMPLING EVENT
JEFFREY ENERGY CENTER BOTTOM ASH SETTLING AREA/BOTTOM ASH LANDFILL
ST. MARYS, KANSAS

													Interwell Analysis	
Location Id	**Frequency of Detection**	**Percent Non-Detects**	**Range of Non-Detects**	**Maximum Detect**	**Variance**	**Standard Deviation**	**Coefficient of Variation**	**Outlier Presence**	**Outlier Removed**	**Trend**	**Distribution Well**	**March 2018 Concentration (mg/L)**	**Background Limits[1] (UPL) mg/L**	**SSI**
CCR APPENDIX-III: Boron, Total (mg/L)														
MW-BAA-2	8/8	0%	-	1.3	1.94E-02	0.139	0.132	No	No	Stable	Parametric	0.72	8.93	No
MW-BAA-3	8/8	0%	-	2.4	1.13E-02	0.106	0.0469	Yes	No	Stable	Parametric	2.2	8.93	No
MW-BAA-7	8/8	0%	-	1.3	3.26E-02	0.181	0.151	No	No	Stable	Parametric	0.90	8.93	No
CCR APPENDIX-III: Calcium, Total (mg/L)														
MW-BAA-2	8/8	0%	-	224	4.41E+02	21	0.115	No	No	Stable	Parametric	135	756	No
MW-BAA-3	8/8	0%	-	539	7.63E+02	27.63	0.0539	No	No	Stable	Parametric	506	756	No
MW-BAA-7	8/8	0%	-	260	1.98E+02	14.07	0.0592	No	No	Stable	Parametric	216	756	No
CCR APPENDIX-III: Chloride, Total (mg/L)														
MW-BAA-2	8/8	0%	-	163	5.29E+02	23	0.184	No	No	Stable	Parametric	70.0	364	No
MW-BAA-3	8/8	0%	-	158	1.56E+01	3.944	0.0254	No	No	Stable	Parametric	149	364	No
MW-BAA-7	8/8	0%	-	201	1.14E+03	33.7	0.186	Yes	No	Stable	Parametric	194	364	No
CCR APPENDIX-III: Fluoride, Total (mg/L)														
MW-BAA-2	8/8	0%	-	0.57	1.82E-03	0.0427	0.0858	No	No	Stable	Parametric	0.57	1.4	No
MW-BAA-3	8/8	0%	-	1	5.47E-03	0.074	0.0796	No	No	Stable	Parametric	0.72	1.4	No
MW-BAA-7	8/8	0%	-	0.9	6.91E-03	0.0831	0.106	No	No	Stable	Parametric	0.77	1.4	No
CCR APPENDIX-III: pH (lab) (SU)														
MW-BAA-2	8/8	0%	-	7.5	1.27E-02	0.113	0.0152	No	No	Stable	Parametric	7.4	7.79	No
MW-BAA-3	8/8	0%	-	7.6	3.43E-02	0.185	0.0257	Yes	No	Stable	Parametric	7.2	7.79	No
MW-BAA-7	8/8	0%	-	7.4	1.07E-02	0.104	0.0141	No	No	Stable	Parametric	7.5	7.79	No
CCR APPENDIX-III: Sulfate, Total (mg/L)														
MW-BAA-2	8/8	0%	-	983	2.24E+04	149.8	0.218	No	No	Stable	Parametric	387	3037	No
MW-BAA-3	8/8	0%	-	2290	1.57E+04	125.5	0.0614	No	No	Stable	Parametric	1940	3037	No
MW-BAA-7	8/8	0%	-	950	8.03E+02	28.33	0.0309	No	No	Stable	Parametric	914	3037	No
CCR APPENDIX-III: Total Dissolved Solids (TDS) (mg/L)														
MW-BAA-2	8/8	0%	-	1510	1.74E+04	131.9	0.103	No	No	Stable	Parametric	949	5039	No
MW-BAA-3	8/8	0%	-	3630	2.72E+04	165	0.0504	No	No	Stable	Parametric	3330	5039	No
MW-BAA-7	8/8	0%	-	1960	5.60E+03	74.82	0.0414	No	No	Stable	Parametric	1800	5039	No

Notes and Abbreviations:

[1] Interwell background data collected from 08/25/2016 through 06/29/2017.
CCR = coal combustion residual
mg/L = milligrams per Liter
SSI = statistically significant increase
SU = standard unit
UPL = upper prediction limit

ATTACHMENT 3
Groundwater Potentiometric Maps

LEGEND

MW-BAA-1
1219.84 WELL NAME AND GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (AMSL), MARCH 2018

MONITORING WELL

PIEZOMETER OBSERVATION ONLY

ESTIMATED GROUNDWATER POTENTIOMETRIC OBSERVATION ELEVATION CONTOUR, 5-FT INTERVAL (AMSL), DASHED WHERE INFERRED

GROUNDWATER FLOW DIRECTION AND APPROXIMATE GROUNDWATER FLOW RATE (FEET/YEAR)

BOTTOM ASH SETTLING AREA / BOTTOM ASH LANDFILL

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. GROUNDWATER POTENTIOMETRIC ELEVATIONS WERE MEASURED 06 MARCH 2018.

3. THE GROUNDWATER FLOW RATE WAS APPROXIMATED USING THE HYDRAULIC GRADIENT CALCULATED FROM GROUNDWATER POTENTIOMETRIC ELEVATIONS MEASURED 06 MARCH 2018 AND THE CONDUCTIVITY VALUES AND EFFECTIVE POROSITY VALUES OBTAINED FROM SLUG TESTS COMPLETED APRIL 2016.

4. AERIAL IMAGERY SOURCE: ESRI, 3 SEPTEMBER 2019

N

0 300 600
SCALE IN FEET

HALEY ALDRICH

EVERGY KANSAS CENTRAL, INC.
JEFFREY ENERGY CENTER
ST. MARY'S, KANSAS

BOTTOM ASH SETTLING AREA / BOTTOM ASH LANDFILL GROUNDWATER POTENTIOMETRIC ELEVATION CONTOUR MAP MARCH 6, 2018

evergy

NOVEMBER 2022

FIGURE 2

LEGEND

MW-BAA-1
1219.84 WELL NAME AND GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (AMSL), SEPTEMBER 2018

MONITORING WELL

PIEZOMETER OBSERVATION ONLY

ESTIMATED GROUNDWATER POTENTIOMETRIC OBSERVATION ELEVATION CONTOUR, 5-FT INTERVAL (AMSL), DASHED WHERE INFERRED

GROUNDWATER FLOW DIRECTION AND APPROXIMATE GROUNDWATER FLOW RATE (FEET/YEAR)

BOTTOM ASH SETTLING AREA / BOTTOM ASH LANDFILL

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. GROUNDWATER POTENTIOMETRIC ELEVATIONS WERE MEASURED 10 SEPTEMBER 2018.

3. THE GROUNDWATER FLOW RATE WAS APPROXIMATED USING THE HYDRAULIC GRADIENT CALCULATED FROM GROUNDWATER POTENTIOMETRIC ELEVATIONS MEASURED 10 SEPTEMBER 2018 AND THE CONDUCTIVITY VALUES AND EFFECTIVE POROSITY VALUES OBTAINED FROM SLUG TESTS COMPLETED APRIL 2016.

4. AERIAL IMAGERY SOURCE: ESRI, 3 SEPTEMBER 2019

N

0 300 600
SCALE IN FEET

HALEY ALDRICH

EVERGY KANSAS CENTRAL, INC.
JEFFREY ENERGY CENTER
ST. MARY'S, KANSAS

BOTTOM ASH SETTLING AREA / BOTTOM ASH LANDFILL GROUNDWATER POTENTIOMETRIC ELEVATION CONTOUR MAP SEPTEMBER 10, 2018

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FIGURE 3