



ANNUAL GROUNDWATER
MONITORING REPORT

COAL COMBUSTION RESIDUALS LANDFILL

ANNUAL GROUNDWATER MONITORING REPORT – 2017

Nucla Station Ash Disposal Facility

Nucla, Colorado

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Table of Contents

- 1.0 INTRODUCTION..... 1
 - 1.1 Facility Information 1
 - 1.2 Purpose 1
- 2.0 GROUNDWATER MONITORING NETWORK PROGRAM STATUS 2
 - 2.1 Completed Key Actions in 2017 2
 - 2.2 Installation and Decommissioning of Monitoring Wells..... 2
 - 2.3 Problems and Resolutions 2
 - 2.4 Proposed Key Activities for 2018 2
- 3.0 GROUNDWATER MONITORING PROGRAM STATUS..... 3
 - 3.1 Groundwater Flow 3
 - 3.2 Monitoring Data (Analytical Results) 3
 - 3.3 Samples Collected 3
 - 3.4 Comparative Statistical Analysis 3
 - 3.4.1 Definitions 4
 - 3.4.2 Unverified Statistically Significant Increases 4
 - 3.4.3 False-positive Statistically Significant Increases 4
 - 3.4.4 Verified Statistically Significant Increases 4
- 4.0 PROGRAM TRANSITIONS 5
 - 4.1.1 Detection Monitoring 5
 - 4.1.2 Assessment Monitoring..... 5
 - 4.1.3 Corrective Measures and Assessment..... 5
- 5.0 RECOMMENDATIONS AND CLOSING 6
- 6.0 REFERENCES..... 7

List of Tables

- Table 1 Sample Results Summary Table – MO-1
- Table 2 Sample Results Summary Table – MO-2
- Table 3 Sample Results Summary Table – MO-3
- Table 4 Sample Results Summary Table – MO-4
- Table 5 Sample Results Summary Table – MO-5
- Table 6 Statistics Summary Table – MO-1
- Table 7 Statistics Summary Table – MO-2
- Table 8 Statistics Summary Table – MO-3
- Table 9 Statistics Summary Table – MO-4
- Table 10 Statistics Summary Table – MO-5

List of Figures

- Figure 1 Monitoring Well Locations and Groundwater Elevations (April 2017)
- Figure 2 Monitoring Well Locations and Groundwater Elevations (October 2017)





1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this report to describe the 2017 groundwater monitoring activities and comparative statistical analysis for the coal combustion residuals (CCR) landfill that serves the Nucla Generating Station, which is owned and operated by Tri-State Generation and Transmission Association, Inc. (Tri-State). This report was written to meet the requirements of 40 CFR 257.90(e).

1.1 Facility Information

Tri-State owns and operates the Nucla Generating Station, a 100-megawatt circulating fluidized bed coal-fired electric generating plant located near the town of Nucla, Colorado. Tri-State disposes of CCRs from the Nucla Generating Station in an existing Tri-State-owned CCR landfill, the Nucla Station Ash Disposal Facility (the Facility), which is located approximately 2.5 miles southeast of the Nucla Generating Station. Within the 81.65-acre property, the CCR disposal footprint comprises approximately 61 acres.

1.2 Purpose

The CCR rule established specific requirements for reporting of groundwater monitoring and corrective action in 40 CFR 257.90. Per part (e) of 40 CFR§ 257.90, no later than January 31, 2018, and annually thereafter, owners or operators of CCR units must prepare an annual groundwater monitoring and corrective action report.



2.0 GROUNDWATER MONITORING NETWORK PROGRAM STATUS

The groundwater monitoring system for the Nucla Station Ash Disposal Facility consists of five monitoring wells (MO-1, MO-2, MO-3, MO-4, and MO-5), as shown on Figure 1 (Golder 2017a).

2.1 Completed Key Actions in 2017

The following key actions were completed in 2017:

- The Groundwater Monitoring System Certification was finalized and placed within the operating record and on Tri-State's publicly accessible CCR website.
- The Groundwater Monitoring Statistical Methods Certification was finalized and placed within the operating record and on Tri-State's publicly accessible CCR website.
- Collection of baseline samples was conducted. Baseline samples were analyzed for the Appendix III and Appendix IV constituent lists associated with the CCR rule.
- The first detection monitoring sampling event was performed.

2.2 Installation and Decommissioning of Monitoring Wells

No monitoring wells were installed or decommissioned for the Nucla Station Ash Disposal Facility in 2017.

2.3 Problems and Resolutions

No problems were identified for 2017.

2.4 Proposed Key Activities for 2018

The following key actions are expected to be completed in 2018:

- Detection monitoring sampling events are planned to occur in the second and fourth quarters of 2018.



3.0 GROUNDWATER MONITORING PROGRAM STATUS

Activities associated with the groundwater monitoring program are described below.

3.1 Groundwater Flow

Groundwater elevations were measured in each well prior to purging during each sampling event. Elevations are presented in Table 1 through Table 5. Groundwater elevations from the April 2017 and October 2017 sampling events are shown on Figure 1 and Figure 2, respectively.

The Morrison aquifer is characterized as highly heterogeneous with zones that are variably transmissive and/or subjected to variable amounts of confining pressure. This characterization is supported by the differences in groundwater levels, water column heights, and recovery times observed in the monitoring wells that have been installed to serve as the groundwater monitoring system for the Facility. Sandstone lenses in the Morrison aquifer vary considerably with respect to transmissivity (i.e., thickness and hydraulic conductivity) and horizontal extent due to the alluvial, shoreline, and lacustrine environments that deposited the Salt Wash and Brushy Basin Members of the Morrison Formation, resulting in interbedded siltstone, mudstone, claystone, and shale units. Groundwater elevation data suggest a general westerly and southerly groundwater flow direction in the Morrison aquifer in the vicinity of the Nucla Station Ash Disposal Facility. However, the heterogeneity and interbedded nature of the Morrison Formation beneath the Facility, coupled with the observation that groundwater levels in the monitoring wells continue to stabilize at the time of this report's preparation, confound the ability to precisely discern groundwater flow direction and rate.

3.2 Monitoring Data (Analytical Results)

Analytical results for the baseline period, including Appendix III and Appendix IV results, are shown in Table 1 through Table 5. Table 1 through Table 5 also include Appendix III detection monitoring results for the October 2017 monitoring event.

3.3 Samples Collected

Baseline samples were collected on an approximately monthly basis between December 13, 2016, and August 8, 2017, at each of the monitoring wells. The first detection monitoring sampling event for Appendix III constituents was conducted on October 3, 2017. During the first four baseline sampling events Appendix III metals were analyzed on a total basis, whereas the samples from the remaining baseline events were analyzed on both a total and total recoverable basis.

3.4 Comparative Statistical Analysis

The comparative statistical analysis is summarized below, and the results are presented in Table 6 through Table 10. A full description of the steps taken for the comparative statistical analysis can be found in the Groundwater Monitoring Statistical Methods Certification (Golder 2017b).



3.4.1 Definitions

The following definitions are used in discussion of the comparative statistical analysis:

- SSI – is a statistically significant increase (SSI) and is defined as an analytical result that exceeds the parametric or non-parametric statistical limit established by the baseline statistical analysis.
- False-positive SSI – is defined as an analytical result that exceeds the statistical limit but can clearly be attributed to laboratory error or changes in analytical precision, or is invalidated through confirmatory resampling.
- Confirmatory resampling – is designated as the resampling event that occurs within 90 days of detecting an SSI over the statistical limit for determination of a verified SSI.
- Verified SSI – is interpreted as two consecutive SSIs (the original sample and the confirmatory resample for analytical results) for the same constituent at the same well

3.4.2 Unverified Statistically Significant Increases

There were no unverified SSIs identified for samples collected during the reporting period.

3.4.3 False-positive Statistically Significant Increases

Since only one detection monitoring event has occurred to date, there were no false-positive SSIs identified for samples collected during the reporting period.

3.4.4 Verified Statistically Significant Increases

Since only one detection monitoring event has occurred to date, no verified SSIs were identified for samples collected during the reporting.



4.0 PROGRAM TRANSITIONS

Beginning in fourth quarter of 2017, the groundwater monitoring program for the Nucla Station Ash Disposal Facility transitioned from the baseline period to detection monitoring. During the baseline period, nine independent samples from each well in the program were collected and analyzed for the constituents listed in Appendix III and Appendix IV of the rule prior to October 17, 2017, as specified in 40 CFR 257.94(b).

4.1.1 Detection Monitoring

Samples for the detection monitoring program will be collected on a semi-annual basis, beginning with the sample collected in October 2017. Tri-State plans to collect semi-annual samples for the detection monitoring program in the second and fourth quarters of 2018.

4.1.2 Assessment Monitoring

The groundwater monitoring program for the Facility is not in assessment monitoring. Assessment monitoring has not been triggered as described in 40 CFR 257.95. No alternative source demonstrations have been made, and no actions are required.

4.1.3 Corrective Measures and Assessment

The groundwater monitoring program for the Facility does not indicate the need for corrective measures. An assessment of corrective measures, as described in 40 CFR 257.96, is not required. No alternative source demonstrations have been made, and no actions are required.



5.0 RECOMMENDATIONS AND CLOSING

This report presents the groundwater monitoring activities and results from the baseline period and the first detection monitoring event for the CCR landfill that serves the Nucla Generating Station, along with the comparative statistical analysis. No SSIs were identified based on the results of the first detection monitoring sampling event. As described in the Groundwater Monitoring System Certification (Golder 2017a) and the Groundwater Monitoring Statistical Methods Certification (Golder 2017b), the groundwater monitoring and analytical procedures meet the requirements of the CCR rule, and modifications to the monitoring network and sampling program are not recommended at this time.

GOLDER ASSOCIATES INC.

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6.0 REFERENCES

Golder Associates Inc., 2017a. Coal Combustion Residuals Landfill Groundwater Monitoring System Certification, Nucla Station Ash Disposal Facility. Report prepared for Tri-State Generation and Transmission Association, Inc. October 16, 2017.

Golder Associates Inc., 2017b. Coal Combustion Residuals Landfill Groundwater Statistical Method Certification, Nucla Station Ash Disposal Facility. Report prepared for Tri-State Generation and Transmission Association, Inc. October 16, 2017.

TABLES

Table 1. Sample Results Summary Table – MO-1

Analytes	Units	12/15/2016	1/16/2017	2/14/2017	3/22/2017	4/19/2017	5/22/2017	6/21/2017	7/13/2017	8/8/2017	10/3/2017
Static Water Level Elevation	ft amsl	5713.9	5714.4	5714.8	5715.3	5715.0	5715.0	5715.2	5715.2	5715.2	5715.3
Appendix III											
Boron, Total	mg/L	0.39	0.36	0.36	0.37	0.36	0.31	0.33	0.34	0.33	--
Boron, Total Recoverable	mg/L	--	--	--	--	0.37	0.35	0.34	0.37	0.33	0.35
Calcium, Total	mg/L	5.1	4.5	3.5	3.5	3.2	2.5	2.4	2.1	2	--
Calcium, Total Recoverable	mg/L	--	--	--	--	3.2	2.5	2.4	2.1	1.9	1.7
Chloride	mg/L	309	300	312	304	315	299	320	289	290	292
Fluoride	mg/L	1.18 J	1.12 J	1.39 J	1.49 J	1.21 J	2.13 J	1.31 J	1.41 J	< 5	1.4 J
pH, Field-Measured	pH units	9.5	9.5	9.8	9.9	10	10.2	10.1	10.1	10.2	10.4
Sulfate	mg/L	938	904	904	885	921	851	857	819	825	813
Total Dissolved Solids	mg/L	3170	3100	2870	2840	3070	2640	2590	2560	2490	2370
Appendix IV											
Antimony, Total	mg/L	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	--
Antimony, Total Recoverable	mg/L	--	--	--	--	<0.004 U	<0.01 U	<0.004 U	<0.004 U	<0.004 U	--
Arsenic, Total	mg/L	0.0195	0.0197	0.0219	0.0204	0.0219	0.0235	0.0244	0.0231	0.0251	--
Arsenic, Total Recoverable	mg/L	--	--	--	--	0.0205	0.023	0.0237	0.0237	0.0278	--
Barium, Total	mg/L	0.044	0.044	0.037	0.035	0.036	0.032	0.028	0.028	0.029	--
Barium, Total Recoverable	mg/L	--	--	--	--	0.036	0.031	0.032	0.03	0.031	--
Beryllium, Total	mg/L	<0.0005 U	0.0002 J	0.0001 J	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	--
Beryllium, Total Recoverable	mg/L	--	--	--	--	<0.0005 U	<0.001 U	<0.0005 U	<0.0005 U	<0.0005 U	--
Cadmium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Cadmium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	<0.001 U	<0.001 U	<0.001 U	--
Chromium, Total	mg/L	0.006	0.006	0.006	0.005	0.004	0.003 J	0.002 J	0.001 J	<0.004 U	--
Chromium, Total Recoverable	mg/L	--	--	--	--	0.004	<0.01 U	0.002 J	<0.004 U	0.001 J	--
Cobalt, Total	mg/L	<0.0005 U	0.0001 J	<0.0005 U	<0.0005 U	0.0001 J	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	--
Cobalt, Total Recoverable	mg/L	--	--	--	--	<0.0005 U	<0.001 U	0.0001 J	<0.0005 U	<0.0005 U	--
Fluoride	mg/L	1.18 J	1.12 J	1.39 J	1.49 J	1.21 J	2.13 J	1.31 J	1.41 J	< 5	--
Lead, Total	mg/L	0.0003 J	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Lead, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	<0.001 U	<0.001 U	<0.001 U	--
Lithium, Total	mg/L	1.62	1.51	1.47	1.53	1.46	1.23	1.3	1.3	1.31	--
Lithium, Total Recoverable	mg/L	--	--	--	--	1.43	1.37	1.36	1.31	1.22	--
Mercury, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Molybdenum, Total	mg/L	0.011	0.013	0.013	0.013	0.012	0.013	0.013	0.013	0.013	--
Molybdenum, Total Recoverable	mg/L	--	--	--	--	0.013	0.013	0.013	0.013	0.014	--
Radium-226 + Radium-228	pCi/L	2.7	3.1	7.6	1.0	1.1	1.9	< LLD	1.0	< LLD	--
Selenium, Total	mg/L	<0.0005 U	0.0003 J	0.0002 J	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0002 J	<0.0005 U	--
Selenium, Total Recoverable	mg/L	--	--	--	--	<0.0005 U	<0.001 U	0.0004 J	<0.0005 U	0.0005	--
Thallium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Thallium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	<0.001 U	<0.001 U	<0.001 U	--

NOTES:

- , not analyzed
- ft amsl, feet above mean sea level
- mg/L, milligrams per liter
- pCi/L, picocuries per liter
- Non-detects have been listed with a "<" at the practical quantitation limit
- U, Analyte not detected above the practical quantitation limit
- J, Analyte detected between the method detection limit and practical quantitation limit
- < LLD, Indicates that both radium 226 and radium 228 were below the respective lower limit of detection

Table 2. Sample Results Summary Table – MO-2

Analytes	Units	12/13/2016	1/16/2017	2/14/2017	3/22/2017	4/20/2017	6/6/2017	6/21/2017	7/12/2017	8/8/2017	10/3/2017
Static Water Level Elevation	ft amsl	5580.7	5591.8	5599.2	5606.8	5615.8	5619.0	5624.7	5631.6	5647.4	5648.2
Appendix III											
Boron, Total	mg/L	0.25 J	0.25 J	0.3	0.3	0.29	0.32	0.26 J	0.34	0.32	--
Boron, Total Recoverable	mg/L	--	--	--	--	0.34	0.26 J	0.31	0.27 J	0.32	0.33
Calcium, Total	mg/L	46.1	49.3	51.7	55.6	50.4	55.7	51.9	53.8	54.9	--
Calcium, total recoverable	mg/L	--	--	--	--	54.4	53.6	54	52.6	52.1	50.9
Chloride	mg/L	1460	1670	1920	1870	2090	1990	2160	1910	2010	2060
Fluoride	mg/L	<5 U	<5 U	1.19 J	1.2 J	<12.5 U	8.58 J	<12.5 U	1.09 J	<12.5 U	<12.5 U
pH, Field-Measured	pH units	8.2	8.3	8.4	8.4	8.3	7.8	8.3	8	7.9	8.2
Sulfate	mg/L	1580	1760	1940	1890	2090	1940	2020	1920	2010	2070
Total Dissolved Solids	mg/L	5160	5810	5900	6120	3070	6040	6330	6070	6200	6260
Appendix IV											
Antimony, Total	mg/L	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	--
Antimony, Total Recoverable	mg/L	--	--	--	--	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	--
Arsenic, Total	mg/L	0.005	0.002 J	0.004 J	0.003 J	0.003 J	0.004 J	0.003 J	0.004 J	0.003 J	--
Arsenic, Total Recoverable	mg/L	--	--	--	--	0.003 J	0.004 J	0.002 J	0.004 J	0.003 J	--
Barium, Total	mg/L	0.054	0.048	0.041	0.034	0.036	0.041	0.039	0.044	0.047	--
Barium, Total Recoverable	mg/L	--	--	--	--	0.034	0.045	0.044	0.046	0.048	--
Beryllium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Beryllium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Cadmium, Total	mg/L	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Cadmium, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Chromium, Total	mg/L	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	0.006 J	<0.01 U	<0.01 U	<0.01 U	--
Chromium, Total Recoverable	mg/L	--	--	--	--	<0.01 U	0.006 J	<0.01 U	<0.01 U	<0.01 U	--
Cobalt, Total	mg/L	<0.001 U	0.0005 J	0.0004 J	<0.001 U	<0.001 U	0.0004 J	0.0005 J	0.0006 J	<0.001 U	--
Cobalt, Total Recoverable	mg/L	--	--	--	--	<0.001 U	0.0004 J	0.0008 J	0.0004 J	0.0006 J	--
Fluoride	mg/L	<5 U	<5 U	1.19 J	1.2 J	<12.5 U	8.58 J	<12.5 U	1.09 J	<12.5 U	--
Lead, Total	mg/L	0.0007 J	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Lead, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Lithium, Total	mg/L	2.69	2.99	3.22	3.4	3.29	3.34	3.2	3.39	3.35	--
Lithium, Total Recoverable	mg/L	--	--	--	--	3.29	3.29	3.42	3.36	3.25	--
Mercury, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Molybdenum, Total	mg/L	0.04	0.049	0.051	0.045	0.049	0.045	0.05	0.054	0.05	--
Molybdenum, Total Recoverable	mg/L	--	--	--	--	0.051	0.051	0.05	0.056	0.054	--
Radium-226 + Radium-228	pCi/L	2.6	3.1	3.9	2.2	2.2	3.1	2.7	2.6	2.3	--
Selenium, Total	mg/L	0.0006 J	0.0011	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	0.0007 J	<0.001 U	--
Selenium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.001 U	0.0009 J	<0.001 U	<0.001 U	--
Thallium, Total	mg/L	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Thallium, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--

NOTES:
 --, not analyzed
 ft amsl, feet above mean sea level
 mg/L, milligrams per liter
 pCi/L, picocuries per liter
 Non-detects have been listed with a "<" at the practical quantitation limit
 U, Analyte not detected above the practical quantitation limit
 J, Analyte detected between the method detection limit and practical quantitation limit



Table 3. Sample Results Summary Table – MO-3

Analytes	Units	12/15/2016	1/17/2017	2/14/2017	3/22/2017	4/19/2017	5/17/2017	6/21/2017	7/12/2017	8/8/2017	10/3/2017
Static Water Level Elevation	ft amsl	5642.5	5635.5	5635.8	5636.1	5637.3	5637.5	5637.3	5637.3	5637.3	5637.0
Appendix III											
Boron, Total	mg/L	0.65	0.66	0.68	0.68	0.67	0.69	0.63	0.68	0.61	--
Boron, Total Recoverable	mg/L	--	--	--	--	0.66	0.66	0.66	0.65	0.63	0.68
Calcium, Total	mg/L	18.2	18.2	18.3	19	17.7	18.1	17.5	17.5	18	--
Calcium, Total Recoverable	mg/L	--	--	--	--	18.4	18.3	17.8	17.3	17.1	16.3
Chloride	mg/L	146	142	158	145	155	145	159	143	148	155
Fluoride	mg/L	2.71	2.59	3	2.85	2.86	2.93	2.66	2.37 J	2.34 J	2.64
pH, Field-Measured	pH units	7.7	7.7	7.9	7.8	7.9	7.8	7.9	7.9	7.8	7.9
Sulfate	mg/L	763	740	818	743	798	739	754	729	751	766
Total Dissolved Solids	mg/L	2440	2360	2200	2370	2420	2320	2310	2380	2350	2330
Appendix IV											
Antimony, Total	mg/L	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.002 U	<0.004 U	<0.004 U	<0.004 U	--
Antimony, Total Recoverable	mg/L	--	--	--	--	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	--
Arsenic, Total	mg/L	0.0226	0.0219	0.025	0.0289	0.0338	0.0394	0.0332	0.0431	0.0431	--
Arsenic, Total Recoverable	mg/L	--	--	--	--	0.0331	0.033	0.0285	0.041	0.0383	--
Barium, Total	mg/L	0.023	0.024	0.025	0.025	0.028	0.0289	0.026	0.028	0.029	--
Barium, Total Recoverable	mg/L	--	--	--	--	0.028	0.027	0.028	0.029	0.03	--
Beryllium, Total	mg/L	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0003 U	<0.0005 U	<0.0005 U	<0.0005 U	--
Beryllium, Total Recoverable	mg/L	--	--	--	--	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	--
Cadmium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.0005 U	<0.001 U	<0.001 U	<0.001 U	--
Cadmium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Chromium, Total	mg/L	<0.004 U	0.001 J	<0.004 U	<0.004 U	<0.004 U	<0.002 U	<0.004 U	<0.004 U	<0.004 U	--
Chromium, Total Recoverable	mg/L	--	--	--	--	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U	--
Cobalt, Total	mg/L	0.0003 J	0.0005	0.0004 J	0.0004 J	0.0004 J	0.00043	0.0003 J	0.0003 J	0.0003 J	--
Cobalt, Total Recoverable	mg/L	--	--	--	--	0.0003 J	0.0003 J	0.0005	0.0002 J	0.0003 J	--
Fluoride	mg/L	2.71	2.59	3	2.85	2.86	2.93	2.66	2.37 J	2.34 J	--
Lead, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.0005 U	<0.001 U	<0.001 U	<0.001 U	--
Lead, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Lithium, Total	mg/L	1.76	1.78	1.88	1.93	1.91	1.88	1.8	1.88	1.86	--
Lithium, Total Recoverable	mg/L	--	--	--	--	1.87	1.88	1.89	1.88	1.82	--
Mercury, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Molybdenum, Total	mg/L	0.004 J	0.006	0.006	0.006	0.005	0.0061	0.005	0.004 J	0.004 J	--
Molybdenum, Total Recoverable	mg/L	--	--	--	--	0.005	0.005	0.005	0.004 J	0.004 J	--
Radium-226 + Radium-228	pCi/L	8	1.5	2.3	1.8	2.2	< LLD	< LLD	1.7	2	--
Selenium, Total	mg/L	<0.0005 U	0.0005	<0.0005 U	<0.0005 U	<0.0005 U	0.0002 J	<0.0005 U	<0.0005 U	<0.0005 U	--
Selenium, Total Recoverable	mg/L	--	--	--	--	<0.0005 U	<0.0005 U	0.0003 J	<0.0005 U	0.0005	--
Thallium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.0005 U	<0.001 U	<0.001 U	<0.001 U	--
Thallium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--

NOTES:
 --, not analyzed
 ft amsl, feet above mean sea level
 mg/L, milligrams per liter
 pCi/L, picocuries per liter
 Non-detects have been listed with a "<" at the practical quantitation limit
 U, Analyte not detected above the practical quantitation limit
 J, Analyte detected between the method detection limit and practical quantitation limit
 < LLD, Indicates that both radium 226 and radium 228 were below the respective lower limit of detection.



Table 4. Sample Results Summary Table – MO-4

Analytes	Units	12/15/2016	1/17/2017	2/13/2017	3/21/2017	4/19/2017	5/17/2017	6/21/2017	7/12/2017	8/7/2017	10/3/2017
Static Water Level Elevation	ft amsl	5636.2	5636.6	5636.9	5637.2	5634.3	5634.6	5634.4	5634.5	5634.5	5634.3
Appendix III											
Boron, Total	mg/L	0.38	0.36	0.41	0.39	0.37	0.4	0.32	0.38	0.4	
Boron, Total Recoverable	mg/L					0.36					
Calcium, Total	mg/L	49.2	48.4	48.9	50.6	46.9	47.1	46.3	46.4	49.4	
Calcium, Total Recoverable	mg/L					48.3					
Chloride	mg/L	894	875	996	906	956	958	1000	890	931	938
Fluoride	mg/L	<5 U	<5 U	1.12 J	1.04 J	<5 U	2.95 J	<5 U	<5 U	<5 U	<5 U
pH, Field-Measured	pH units	7.4	7.4	7.5	7.4	7.5	7.5	7.6	7.5	7.6	7.5
Sulfate	mg/L	1860	1820	1810	1840	1950	1940	1910	1830	1920	1920
Total Dissolved Solids	mg/L	5180	5000	5210	5190	5100	4890	5140	4690	5150	5120
Appendix IV											
Antimony, Total	mg/L	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	--
Antimony, Total Recoverable	mg/L	--	--	--	--	<0.01 U	<0.02 U	<0.01 U	<0.01 U	<0.01 U	--
Arsenic, Total	mg/L	0.033	0.045	0.046	0.034	0.031	0.03	0.026	0.028	0.027	--
Arsenic, Total Recoverable	mg/L	--	--	--	--	0.035	0.034	0.027	0.028	0.027	--
Barium, Total	mg/L	0.052	0.045	0.021	0.015	0.014	0.012	0.012	0.011	0.011	--
Barium, Total Recoverable	mg/L	--	--	--	--	0.015	0.013 J	0.013	0.011	0.012	--
Beryllium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Beryllium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	<0.001 U	<0.001 U	<0.001 U	--
Cadmium, Total	mg/L	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Cadmium, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.005 U	<0.003 U	<0.003 U	<0.003 U	--
Chromium, Total	mg/L	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	--
chromium, Total Recoverable	mg/L	--	--	--	--	<0.01 U	<0.02 U	<0.01 U	<0.01 U	<0.01 U	--
Cobalt, Total	mg/L	0.0007 J	0.0011	0.0003 J	0.0003 J	<0.001 U	0.0006 J	0.0003 J	0.0005 J	<0.001 U	--
Cobalt, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	0.0006 J	<0.001 U	0.0006 J	--
Fluoride	mg/L	<5 U	<5 U	1.12 J	1.04 J	<5 U	2.95 J	<5 U	<5 U	<5 U	--
Lead, Total	mg/L	0.001 J	0.0012 J	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Lead, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.005 U	<0.003 U	<0.003 U	<0.003 U	--
Lithium, Total	mg/L	3.28	3.12	3.39	3.46	3.48	3.3	3.16	3.24	3.32	--
Lithium, Total Recoverable	mg/L	--	--	--	--	3.26	3.34	3.36	3.29	3.23	--
Mercury, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Molybdenum, Total	mg/L	0.003 J	0.004 J	<0.01 U	<0.01 U	<0.01 U	0.004 J	0.003 J	0.003 J	0.003 J	--
Molybdenum, Total Recoverable	mg/L	--	--	--	--	<0.01 U	<0.03 U	0.003 J	0.003 J	0.004 J	--
Radium-226 + Radium-228	pCi/L	5.4	3.7	2.9	0.79	2	< LLD	< LLD	0.6	0.91	--
Selenium, Total	mg/L	<0.001 U	0.0008 J	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Selenium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	0.0005 J	<0.001 U	0.0008 J	--
Thallium, Total	mg/L	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Thallium, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.005 U	<0.003 U	<0.003 U	<0.003 U	--

NOTES:

- , not analyzed
- ft amsl, feet above mean sea level
- mg/L, milligrams per liter
- pCi/L, picocuries per liter
- Non-detects have been listed with a "<" at the practical quantitation limit
- U, Analyte not detected above the practical quantitation limit
- J, Analyte detected between the method detection limit and practical quantitation limit
- < LLD, Indicates that both radium 226 and radium 228 were below the respective lower limit of detection.



Table 5. Sample Results Summary Table – MO-5

Analytes	Units	12/13/2016	1/17/2017	2/13/2017	3/21/2017	4/19/2017	6/5/2017	6/21/2017	7/12/2017	8/7/2017	10/3/2017
Static Water Level Elevation	ft amsl	5439.3	5450.3	5456.0	5464.2	5474.7	5481.7	5490.5	5498.1	5510.2	5539.5
Appendix III											
Boron, Total	mg/L	0.38	0.38	0.41	0.4	0.41	0.45	0.33	0.38	0.41	--
Boron, Total Recoverable	mg/L	--	--	--	--	0.36	0.37	0.36	0.35	0.42	0.42
Calcium, Total	mg/L	35.1	38.9	37.1	46.7	28.4	32.1	29.4	29.4	29.5	--
Calcium, Total Recoverable	mg/L	--	--	--	--	30.5	32.1	29.7	29.2	28.6	27.2
Chloride	mg/L	719	838	985	937	1010	969	1090	963	994	1050
Fluoride	mg/L	<12.5 U	1.29 J	1.44 J	1.29 J	<5 U	4.58 J	<5 U	1.15 J	<5 U	<5 U
pH, Field-Measured	pH units	7.6	8.1	8.2	8.2	8.3	7.9	7.7	8.2	8.2	8.3
Sulfate	mg/L	1840	1770	1840	1810	1880	1760	1830	1760	1830	1910
Total Dissolved Solids	mg/L	4940	5160	4840	5160	5120	5100	5060	5180	5220	5220
Appendix IV											
Antimony, Total	mg/L	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	--
Antimony, Total Recoverable	mg/L	--	--	--	--	<0.01 U	<0.02 U	<0.01 U	<0.01 U	<0.01 U	--
Arsenic, Total	mg/L	0.006	0.011	0.01	0.014	0.009	0.01	0.008	0.009	0.01	--
Arsenic, Total Recoverable	mg/L	--	--	--	--	0.01	0.01	0.01	0.01	0.009	--
Barium, Total	mg/L	0.028	0.158	0.167	0.351	0.042	0.042	0.022	0.021	0.022	--
Barium, Total Recoverable	mg/L	--	--	--	--	0.056	0.042	0.024	0.025	0.024	--
Beryllium, Total	mg/L	<0.001 U	0.001	0.0007 J	0.0017	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Beryllium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	<0.001 U	<0.001 U	<0.001 U	--
Cadmium, Total	mg/L	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Cadmium, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.005 U	0.0006 J	<0.003 U	<0.003 U	--
Chromium, Total	mg/L	<0.01 U	0.009 J	0.008 J	0.018	<0.01 U	0.004 J	<0.01 U	<0.01 U	<0.01 U	--
Chromium, Total Recoverable	mg/L	--	--	--	--	<0.01 U	<0.02 U	<0.01 U	<0.01 U	<0.01 U	--
Cobalt, Total	mg/L	0.0004 J	0.0032	0.0024	0.005	0.0005 J	0.0007 J	0.0006 J	<0.001 U	<0.001 U	--
Cobalt, Total Recoverable	mg/L	--	--	--	--	0.0006 J	<0.003 U	0.0009 J	<0.001 U	0.0005 J	--
Fluoride	mg/L	<12.5 U	1.29 J	1.44 J	1.29 J	<5 U	4.58 J	<5 U	1.15 J	<5 U	--
Lead, Total	mg/L	<0.003 U	0.0055	0.0052	0.0121	0.001 J	0.0007 J	<0.003 U	<0.003 U	<0.003 U	--
Lead, Total Recoverable	mg/L	--	--	--	--	0.0012 J	<0.005 U	<0.003 U	<0.003 U	<0.003 U	--
Lithium, Total	mg/L	2.68	2.75	2.87	3.09	3.04	2.96	2.85	2.92	2.98	--
Lithium, Total Recoverable	mg/L	--	--	--	--	3.04	2.96	2.94	2.96	2.94	--
Mercury, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.002 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Molybdenum, Total	mg/L	0.025	0.022	0.017	0.008 J	0.007 J	0.006 J	0.008 J	0.008 J	0.008 J	--
Molybdenum, Total Recoverable	mg/L	--	--	--	--	0.008 J	0.006 J	0.008 J	0.009 J	0.009 J	--
Radium-226 + Radium-228	pCi/L	1.1	7	8.1	5.1	2.2	< LLD	< LLD	0.64	1.1	--
Selenium, Total	mg/L	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	--
Selenium, Total Recoverable	mg/L	--	--	--	--	<0.001 U	<0.003 U	<0.001 U	<0.001 U	0.0006 J	--
Thallium, Total	mg/L	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	<0.003 U	--
Thallium, Total Recoverable	mg/L	--	--	--	--	<0.003 U	<0.005 U	<0.003 U	<0.003 U	<0.003 U	--

NOTES:

- , not analyzed
- ft amsl, feet above mean sea level
- mg/L, milligrams per liter
- pCi/L, picocuries per liter
- Non-detects have been listed with a "<" at the practical quantitation limit
- U, Analyte not detected above the practical quantitation limit
- J, Analyte detected between the method detection limit and practical quantitation limit
- < LLD, Indicates that both radium 226 and radium 228 were below the respective lower limit of detection.

Table 6. Statistics Summary Table – MO-1

Analytes	Units	Selected Statistical Method	Statistical Limit	Compliance Data Point (10/3/2017)	SSI Determination
Appendix III					
Boron, Total Recoverable ¹	mg/L	P-PL	0.43	0.35	No
Calcium, Total Recoverable ¹	mg/L	Trend ²	--	1.7	No
Chloride	mg/L	P-PL	341	292	No
Fluoride	mg/L	P-PL	2.8	1.4 J	No
pH, Field-Measured ³	pH units	P-PL	9.8, 10.0	10.4 (9.9)	No
Sulfate	mg/L	Trend ²	--	813	No
Total Dissolved Solids	mg/L	Trend ²	--	2370	No

NOTES:

P-PL, Parametric Prediction Limit

NP-PL, Non-parametric Prediction Limit

J, Analyte detected between the method detection limit and practical quantitation limit

mg/L, milligrams per liter

1. Statistical Limits were based on total analysis. Only total recoverable analyses were conducted for the compliance sampling event and have been used for comparisons.

2. Trend analysis used for the determination of SSIs.

3. A statistical limit was established using detrended data. Compliance data is detrended for comparison to statistical limit. Detrended value is shown in parentheses.

Table 7. Statistics Summary Table – MO-2

Analytes	Units	Selected Statistical Method	Statistical Limit	Compliance Data Point (10/3/2017)	SSI Determination
Appendix III					
Boron, Total Recoverable ¹	mg/L	P-PL	0.40	0.33	No
Calcium, Total Recoverable ¹	mg/L	P-PL	63.0	50.9	No
Chloride	mg/L	P-PL	2626	2060	No
Fluoride	mg/L	NP-PL	12.5	<12.5 U	No
pH, Field-Measured	pH units	P-PL	7.4, 8.9	8.2	No
Sulfate	mg/L	P-PL	2424	2070	No
Total Dissolved Solids	mg/L	Trend ²	-	6260	No

NOTES:

P-PL, Parametric Prediction Limit

NP-PL, Non-parametric Prediction Limit

U, Analyte not detected above the practical quantitation limit

mg/L, milligrams per liter

1. Statistical Limits were based on total analysis. Only total recoverable analyses were conducted for the compliance sampling event and have been used for comparisons.

2. Trend analysis used for the determination of SSIs.

Table 8. Statistics Summary Table – MO-3

Analytes	Units	Selected Statistical Method	Statistical Limit	Compliance Data Point (10/3/2017)	SSI Determination
Appendix III					
Boron, Total Recoverable ¹	mg/L	P-PL	0.75	0.68	No
Calcium, Total Recoverable ¹	mg/L	P-PL	19.6	16.3	No
Chloride	mg/L	P-PL	171	155	No
Fluoride	mg/L	P-PL	3.50	2.64	No
pH, Field-Measured	pH units	NP-PL	7.7, 7.9	7.9	No
Sulfate	mg/L	P-PL	860	766	No
Total Dissolved Solids	mg/L	P-PL	2587	2330	No

NOTES:

P-PL, Parametric Prediction Limit

NP-PL, Non-parametric Prediction Limit

mg/L, milligrams per liter

1. Statistical Limits were based on total analysis. Only total recoverable analyses were conducted for the compliance sampling event and have been used for comparisons.

Table 9. Statistics Summary Table – MO-4

Analytes	Units	Selected Statistical Method	Statistical Limit	Compliance Data Point (10/3/2017)	SSI Determination
Appendix III					
Boron, Total Recoverable ¹	mg/L	P-PL	0.47	0.42	No
Calcium, Total Recoverable ¹	mg/L	P-PL	53.3	44.4	No
Chloride	mg/L	P-PL	1090	938	No
Fluoride	mg/L	NP-PL	5	<5 U	No
pH, Field-Measured	pH units	Trend ²	--	7.5	No
Sulfate	mg/L	P-PL	2060	1920	No
Total Dissolved Solids	mg/L	NP-PL	5210	5120	No

NOTES:

P-PL, Parametric Prediction Limit

NP-PL, Non-parametric Prediction Limit

U, Analyte not detected above the practical quantitation limit

mg/L, milligrams per liter

1. Statistical Limits were based on total analysis. Only total recoverable analyses were conducted for the compliance sampling event and have been used for comparisons.

2. Trend analysis used for the determination of SSIs.

Table 10. Statistics Summary Table – MO-5

Analytes	Units	Selected Statistical Method	Statistical Limit	Compliance Data Point (10/3/2017)	SSI Determination
Appendix III					
Boron, Total Recoverable ¹	mg/L	P-PL	0.51	0.42	No
Calcium, Total Recoverable ¹	mg/L	P-PL	54.5	27.2	No
Chloride	mg/L	P-PL	1309	1050	No
Fluoride	mg/L	P-PL	8.07	<5 U	No
pH, Field-Measured	pH units	NP-PL	7.6, 8.3	8.3	No
Sulfate	mg/L	P-PL	1955	1910	No
Total Dissolved Solids	mg/L	P-PL	5503	5220	No

NOTES:

P-PL, Parametric Prediction Limit

NP-PL, Non-parametric Prediction Limit

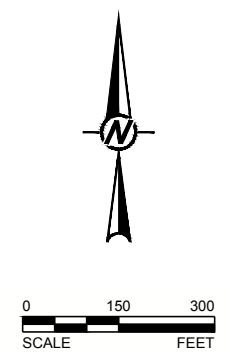
U, Analyte not detected above the practical quantitation limit

1. Statistical Limits were based on total analysis. Only total recoverable analyses were conducted for the compliance sampling event and have been used for comparisons.


FIGURES



- LEGEND**
- PROPERTY BOUNDARY
 - EXISTING GROUND TOPOGRAPHY
 - MO-1 MONITORING WELL
 - 5915 GROUNDWATER ELEVATION (APRIL 2017)



Path: J:\17\CB95\1779126\2017 Tri-State Nucla\CCB_GW_1 File Name: CCB Well Locations-Aerial_Topo_April17.dwg

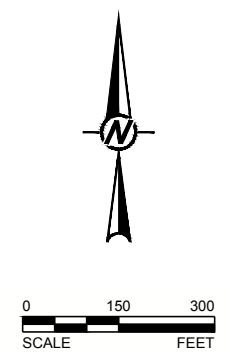
CLIENT		PROJECT	
TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION		NUCLA STATION ASH DISPOSAL FACILITY	
1100 WEST 116TH AVENUE		COAL COMBUSTION RESIDUALS LANDFILL	
WESTMINSTER, COLORADO 80234		ANNUAL GROUNDWATER MONITORING REPORT	
CONSULTANT		YYYY-MM-DD	2017-01-10
		DESIGNED	KAC
		PREPARED	KAC
		REVIEWED	JEO
		APPROVED	RRJ

TITLE		PROJECT NO.	REV.	FIGURE
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS (APRIL 2017)		1779126B	1	1


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



- LEGEND**
- PROPERTY BOUNDARY
 - EXISTING GROUND TOPOGRAPHY
 - MO-1 MONITORING WELL
 - 5915 GROUNDWATER ELEVATION (OCTOBER 2017)



Path: J:\17\CB95\1779126_2017_Tri-State Nucla\CCF_GW_1_File Name: CCF Well Locations-Aerial_Topo_October17.dwg

CLIENT		PROJECT	
TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION		NUCLA STATION ASH DISPOSAL FACILITY	
1100 WEST 116TH AVENUE		COAL COMBUSTION RESIDUALS LANDFILL	
WESTMINSTER, COLORADO 80234		ANNUAL GROUNDWATER MONITORING REPORT	
CONSULTANT		YYYY-MM-DD	2017-01-10
		DESIGNED	KAC
		PREPARED	KAC
		REVIEWED	JEO
		APPROVED	RRJ

TITLE		PROJECT NO.	REV.	FIGURE
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS (OCTOBER 2017)		1779126B	1	2

1" IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANS D

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