



REPORT

Annual Groundwater Monitoring Report – 2025

*Active Coal Combustion Residuals Landfill
Escalante Station
Prewitt, New Mexico*

Submitted to:

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Executive Summary

This report summarizes the groundwater monitoring activities and results for the 2025 detection monitoring program for the active coal combustion residuals (CCR) landfill at Escalante Station, along with the comparative statistical analysis. The active CCR landfill, which is owned and operated by Tri-State Generation and Transmission Association, Inc., is currently in detection monitoring, and no program transitions occurred in 2025.

No verified statistically significant increases (SSIs) were identified from the 2025 detection monitoring program. A potential exceedance was identified for field pH in TRcpc-17 during the first semi-annual 2025 sampling event; the measured pH was less than the lower non-parametric prediction limit. The potential exceedance was not verified by confirmatory resampling conducted in conjunction with the second semi-annual 2025 sampling event and was re-classified as a false-positive SSI.

The total recoverable boron concentration and the fluoride concentration in the sample collected from TRcpc-17 during the second semi-annual 2024 sampling event exceeded the respective non-parametric prediction limits and were identified as potential exceedances. Confirmatory resampling was conducted in February 2025. The confirmatory resampling results verified the SSIs for total recoverable boron and fluoride in TRcpc-17. An alternative source demonstration (ASD) was conducted in June 2025 to demonstrate that the verified SSIs for total recoverable boron and fluoride in TRcpc-17 were not an indication of a release from the facility, and it was recommended that the facility remain in detection monitoring.

As described in the Groundwater Monitoring System Certification (Golder 2017) and the Groundwater Statistical Method Certification (Golder 2020), the groundwater monitoring and analytical procedures for the program meet the requirements of 40 CFR 257 Subpart D (the CCR Rule). Modifications to the monitoring network and sampling program are not necessary at this time.

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Alternative Source Demonstration for Boron and Fluoride in Monitoring Well TRcpc-17

1.0 INTRODUCTION

WSP USA Inc. (WSP) has prepared this report to describe the 2025 groundwater monitoring activities and comparative statistical analysis for the active coal combustion residuals (CCR) landfill at Escalante Station (the site), which is owned and operated by Tri-State Generation and Transmission Association, Inc. (Tri-State) and subject to regulation under 40 CFR 257 Subpart D (the CCR Rule). This report was written to meet the requirements of 40 CFR 257.90(e).

1.1 Facility Information

Escalante Station is a retired 270-megawatt coal-fired electric generation facility located near Prewitt, New Mexico. The generating unit was retired in August 2020. The active CCR landfill at the site contains fly ash, bottom ash, and flue gas desulfurization solids (scrubber solids).

1.2 Purpose

The CCR Rule establishes specific requirements for reporting of groundwater monitoring activities and corrective action in 40 CFR 257.90. Per 40 CFR 257.90(e), 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 PROGRAM STATUS

The groundwater monitoring system for the active CCR landfill at Escalante Station consists of six monitoring wells, as described in the Groundwater Monitoring System Certification (Golder 2017). The two upgradient monitoring wells are TRcpc-1 and TRcpc-2. The four downgradient monitoring wells are TRcpc-15, TRcpc-16, TRcpc-17, and TRcpc-18.

2.1 Completed Key Actions in 2025

The following key actions were completed in 2025:

- The 2024 Annual Groundwater Monitoring Report (WSP 2025) was finalized and placed within the operating record and on Tri-State's publicly accessible CCR website.
- Confirmatory resampling was conducted on February 17, 2025, for the potential exceedances identified from the second semi-annual 2024 sampling event.
- An alternative source demonstration (ASD) was conducted in June 2025 to demonstrate that the verified statistically significant increase (SSI) for total recoverable boron and fluoride in TRcpc-17, which was identified following the February 2025 confirmatory resampling event, was not an indication of a release from the facility, and it was recommended that the facility remain in detection monitoring.
- The first semi-annual 2025 sampling event was performed in the second quarter, on May 27 and 28.
- The second semi-annual 2025 sampling event was performed in the fourth quarter, on October 1 and 6.

2.2 Installation and Decommissioning of Monitoring Wells

No monitoring wells were installed or decommissioned for the active CCR landfill at Escalante Station in 2025.

2.3 Problems and Resolutions

A confirmatory resampling event was conducted on December 18, 2024, in connection with the October 2024 sampling event. However, the laboratory qualified the fluoride result with a “cn” qualifier, indicating that more details are provided in the case narrative. The case narrative indicated that there were chromatic interferences during the ion chromatography testing of fluoride and that the fluoride result would have been adversely affected, resulting in a low bias. After communication with the laboratory, a second confirmatory resampling event was recommended. The second confirmatory resampling event was conducted on February 17, 2025.

No other problems were identified in 2025.

2.4 Proposed Key Activities for 2025

The following key actions are expected to be completed in 2026:

- Sampling events for detection monitoring are planned to occur in the second and fourth quarters of 2026.

3.0 GROUNDWATER MONITORING RESULTS AND ANALYSIS

Results from the groundwater monitoring program in 2025 are described in this section.

3.1 Groundwater Flow

The static water level was measured in each monitoring well prior to purging during each sampling event. Static water elevations are presented in Table 1 through Table 6. Static water elevations from the first semi-annual 2025 sampling event and the second semi-annual 2025 sampling event are shown in Figure 1 and Figure 2, respectively.

Based on the static water elevations in 2025, the groundwater in the Correo sandstone beneath the active CCR landfill generally flows east with a localized northerly flow component.

The groundwater flow rate was estimated with the equation:

$$V_s = k \times i / n_e \quad \text{Equation 1}$$

where:

- V_s is the groundwater flow rate, in feet per day (ft/day).
- k is the hydraulic conductivity, which is estimated to range from 0.00296 to 12.7 from site pumping test data, in ft/day.
- i is the hydraulic gradient calculated by dividing the difference between static water elevations in TRcpc-1 and TRcpc-16 by the horizontal distance between these monitoring wells, in feet per foot (ft/ft).
- n_e is the effective porosity, which is estimated to be 0.33 based on historical testing results for samples of Correo sandstone obtained on site.

Groundwater flow velocity estimates range from 0.00012 ft/day to 0.51 ft/day for the first and second semi-annual 2025 sampling events.

3.2 Monitoring Data (Analytical Results)

Analytical results from detection monitoring in 2025 are shown in Table 1 through Table 6.

3.3 Samples Collected

The sampling events for detection monitoring were conducted in May 2025 (first semi-annual 2025 sampling event) and October 2025 (second semi-annual 2025 sampling event). The October 2025 sample for TRcp-17 also served as the confirmatory resample for a potential exceedance identified for the first semi-annual 2025 sampling event. Additionally, a sample was collected from TRcp-17 in February 2025 for confirmatory resampling associated with the detection monitoring program.

3.4 Comparative Statistical Analysis

The comparative statistical analysis is summarized in this section, and the results are presented in Table 7 through Table 12. A full description of the steps taken for the comparative statistical analysis can be found in the Groundwater Statistical Method Certification (Golder 2020).

3.4.1 Definitions

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

- **SSI**—is a statistically significant increase and is defined as an analytical result that exceeds the parametric or non-parametric statistical limit established by the baseline statistical analysis.
- **Potential exceedance**—is defined as an initial analytical result that exceeds the parametric or non-parametric statistical limit established by the baseline statistical analysis. Confirmatory resampling is used to determine whether the potential exceedance is a false-positive SSI or a verified SSI.
- **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 identifying an SSI over the statistical limit for determination of a verified SSI¹.
- **Verified SSI**—is interpreted as two consecutive SSIs (the original sample and the confirmatory resample for analytical results) for the same constituent in the same monitoring well.

If the data are assessed with a trend test, confirmatory resampling is generally not applicable, and a verified SSI is defined as a statistically significant increasing trend in the eight most recent results.

3.4.2 Potential Exceedances

The total recoverable boron and fluoride concentrations for the sample collected from TRcp-17 during the second semi-annual 2024 sampling event were greater than the respective statistical limits and were therefore identified as potential exceedances. Results of the confirmatory resampling conducted in February 2025 are discussed in Section 3.4.4.

¹ Confirmatory resampling may not occur within 90 days of the sampling event that resulted in the potential exceedance because of the additional time required for activities that must occur before a potential exceedance can be identified. These include sample delivery, analytical testing, review of results, and comparative statistical analysis.

The field pH result for the first semi-annual 2025 sample collected from TRcpc-17 was lower than the lower non-parametric prediction limit and was identified as a potential exceedance. Results of the confirmatory resampling conducted as a part of the second semi-annual 2025 sampling event are discussed in Section 3.4.3.

No other potential exceedances were identified for the 2025 detection monitoring program.

3.4.3 False-Positive Statistically Significant Increases

Confirmatory resampling for the potential exceedance associated with the first semi-annual 2025 sampling event occurred as part of the second semi-annual 2025 sampling event. The confirmatory resampling identified the field pH result for the sample collected from TRcpc-17 during the first semi-annual 2025 sampling event as a false-positive SSI.

3.4.4 Verified Statistically Significant Increases

Confirmatory resampling for potential exceedances associated with the second semi-annual 2024 sampling event (total recoverable boron and fluoride in TRcpc-17) occurred in February 2025. The results of the confirmatory resampling identified the total recoverable boron and fluoride results for the second semi-annual 2024 sample from TRcpc-17 as verified SSIs. In June 2025, an ASD was conducted for total recoverable boron and fluoride in TRcpc-17, and it was recommended that the program remain in detection monitoring. The ASD is provided as Appendix A.

No verified SSIs were identified for samples collected during the first or second semi-annual 2025 sampling events.

4.0 PROGRAM TRANSITIONS

In the third quarter of 2017, the groundwater monitoring program for the active CCR landfill at Escalante Station transitioned from the baseline period to detection monitoring. The facility remains in detection monitoring, and no program transitions occurred in 2025.

4.1 Detection Monitoring

Samples for the detection monitoring program are collected on a semi-annual basis, beginning with the samples collected on August 31, 2017. Tri-State plans to collect semi-annual samples for the detection monitoring program in the second and fourth quarters of 2026.

4.2 Assessment Monitoring

The groundwater monitoring program for the active CCR landfill at Escalante Station is not in assessment monitoring. Assessment monitoring has not been triggered as described in 40 CFR 257.95. As such, no ASDs have been made under an assessment monitoring program, and no actions are required.

4.3 Corrective Measures and Assessment

The groundwater monitoring program for the active CCR landfill at Escalante Station does not indicate the need for corrective measures. An assessment of corrective measures, as described in 40 CFR 257.96, is not required.

5.0 RECOMMENDATIONS AND CLOSING

This report describes the groundwater monitoring activities and results for the 2025 detection monitoring program for the active CCR landfill at Escalante Station, along with the comparative statistical analysis. The significant findings from the 2025 monitoring activities and comparative statistical analysis are as follows:

- Potential exceedances for total recoverable boron and fluoride in TRcpc-17 that were identified from the second semi-annual 2024 sampling event (WSP 2025) were verified as SSIs following the confirmatory resampling event in February 2025. An ASD was conducted in June 2025 to demonstrate that the verified SSIs for total recoverable boron and fluoride in TRcpc-17 were not an indication of a release from the facility, and it was recommended that the facility remain in detection monitoring. No further actions are required.
- No verified SSIs were identified for samples collected during the first and second semi-annual 2025 sampling events.
- A potential exceedance for field pH in TRcpc-17 was identified from the first semi-annual 2025 sampling event. A confirmatory resample was collected during the second semi-annual 2025 sampling event. The result of the confirmatory resample identified the result as a false-positive SSI. No further actions are required.
- No other potential exceedances or false-positive SSIs were identified for the 2025 detection monitoring program.

As described in the Groundwater Monitoring System Certification (Golder 2017) and the Groundwater Statistical Method Certification (Golder 2020), the groundwater monitoring and analytical procedures meet the requirements of the CCR Rule. Modifications to the monitoring network and sampling program are not necessary at this time.

Signature Page

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6.0 REFERENCES

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Golder. 2020. Active Coal Combustion Residuals Landfill Groundwater Statistical Method Certification, Escalante Generating Station. Report prepared for Tri-State Generation and Transmission Association, Inc. June 29.

WSP (WSP USA Inc.). 2025. Annual Groundwater Monitoring Report – 2024, Active Coal Combustion Residuals Landfill, Escalante Station. Report prepared for Tri-State Generation and Transmission Association, Inc. January 27.

Tables

Table 1: Sample Results Summary Table – TRcpcc-1

Analytes	Units	Compliance Point (5/27/2025)	Compliance Point (10/1/2025)
Static Water Elevation	ft amsl	6861.4	6861.0
Appendix III			
Boron, Total Recoverable	mg/L	1.6	1.7
Calcium, Total Recoverable	mg/L	12	12
Chloride	mg/L	620	650
Fluoride	mg/L	1.5	1.7
pH, Field-Measured	pH units	7.9	8.2
Sulfate	mg/L	810	860
Total Dissolved Solids	mg/L	2500	2500

NOTES:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Table 2: Sample Results Summary Table – TRcpcc-2

Analytes	Units	Compliance Point (5/27/2025)	Compliance Point (10/1/2025)
Static Water Elevation	ft amsl	6851.7	6851.4
Appendix III			
Boron, Total Recoverable	mg/L	1.5	1.6
Calcium, Total Recoverable	mg/L	14	14
Chloride	mg/L	1100	1200
Fluoride	mg/L	1.7	2.0
pH, Field-Measured	pH units	7.7	8.1
Sulfate	mg/L	500	580
Total Dissolved Solids	mg/L	2800	2800

NOTES:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Table 3: Sample Results Summary Table – TRcpC-15

Analytes	Units	Compliance Point (5/28/2025)	Compliance Point (10/6/2025) ⁽¹⁾
Static Water Elevation	ft amsl	6829.1	6828.9
Appendix III			
Boron, Total Recoverable	mg/L	1.4	1.4
Calcium, Total Recoverable	mg/L	5.5	5.3
Chloride	mg/L	560	580
Fluoride	mg/L	2.7	3.0
pH, Field-Measured	pH units	7.8	8.4
Sulfate	mg/L	210	220
Total Dissolved Solids	mg/L	1600	1600

NOTES:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

1) The September 25, 2025, water level measurement is used instead of the October 6, 2025, water level measurement due to issues with the level sensor at this location.

Table 4: Sample Results Summary Table – TRcpcc-16

Analytes	Units	Compliance Point (5/28/2025)	Compliance Point (10/6/2025)
Static Water Elevation	ft amsl	6828.1	6828.1
Appendix III			
Boron, Total Recoverable	mg/L	1.5	1.4
Calcium, Total Recoverable	mg/L	4.3	3.7
Chloride	mg/L	430	450
Fluoride	mg/L	3.5	3.8
pH, Field-Measured	pH units	8.0	8.8
Sulfate	mg/L	210	220
Total Dissolved Solids	mg/L	1400	1500

NOTES:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Table 5: Sample Results Summary Table – TRcpC-17

Analytes	Units	Confirmatory Resample Point (2/17/2025)	Compliance Point (5/28/2025)	Compliance Point (10/6/2025)
Static Water Elevation	ft amsl	6830.6	6830.4	6830.5
Appendix III				
Boron, Total Recoverable	mg/L	1.6	1.4	1.3
Calcium, Total Recoverable	mg/L		13	12
Chloride	mg/L		1200	1200
Fluoride	mg/L	2.9	2.5	2.7
pH, Field-Measured	pH units	7.6	7.7	8.4
Sulfate	mg/L		260	260
Total Dissolved Solids	mg/L		2700	2600

NOTES:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Table 6: Sample Results Summary Table – TRcpcc-18

Analytes	Units	Compliance Point (5/28/2025)	Compliance Point (10/6/2025)
Static Water Elevation	ft amsl	6841.1	6841.1
Appendix III			
Boron, Total Recoverable	mg/L	0.77	0.67
Calcium, Total Recoverable	mg/L	2.8	2.4
Chloride	mg/L	340	350
Fluoride	mg/L	1.2	1.4
pH, Field-Measured	pH units	9.3	9.8
Sulfate	mg/L	150	150
Total Dissolved Solids	mg/L	1100	1100

NOTES:

ft amsl: feet above mean sea level

mg/L: milligrams per liter

Table 7: Statistics Summary Table – TRcpc-1

Analytes	Units	Selected Statistical Method	Statistical Limit	Quarter 2		Quarter 4	
				Compliance Point (5/27/2025)	SSI Determination	Compliance Point (10/1/2025)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	NP-PL	1.7	1.6	No	1.7	No
Calcium, Total Recoverable	mg/L	NP-PL	13	12	No	12	No
Chloride	mg/L	P-PL	701	620	No	650	No
Fluoride	mg/L	NP-PL	1.8	1.5	No	1.7	No
pH, Field-Measured	pH units	P-PL	7.4, 9.4	7.9	No	8.2	No
Sulfate	mg/L	P-PL	939	810	No	860	No
Total Dissolved Solids	mg/L	NP-PL	3200	2500	No	2500	No

NOTES:

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

Table 8: Statistics Summary Table – TRcpc-2

Analytes	Units	Selected Statistical Method	Statistical Limit	Quarter 2		Quarter 4	
				Compliance Point (5/27/2025)	SSI Determination	Compliance Point (10/1/2025)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	NP-PL	1.6	1.5	No	1.6	No
Calcium, Total Recoverable	mg/L	NP-PL	16	14	No	14	No
Chloride	mg/L	NP-PL	1200	1100	No	1200	No
Fluoride	mg/L	P-PL	2.4	1.7	No	2.0	No
pH, Field-Measured	pH units	P-PL	7.6, 8.9	7.7	No	8.1	No
Sulfate	mg/L	P-PL	623	500	No	580	No
Total Dissolved Solids	mg/L	NP-PL	2900	2800	No	2800	No

NOTES:

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

Table 9: Statistics Summary Table – TRcpc-15

Analytes	Units	Selected Statistical Method	Statistical Limit	Quarter 2		Quarter 4	
				Compliance Point (5/28/2025)	SSI Determination	Compliance Point (10/6/2025)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	NP-PL	1.5	1.4	No	1.4	No
Calcium, Total Recoverable	mg/L	Trend ⁽¹⁾	NL	5.5	No	5.3	No
Chloride	mg/L	P-PL	619	560	No	580	No
Fluoride	mg/L	NP-PL	3.0	2.7	No	3.0	No
pH, Field-Measured	pH units	Trend ⁽¹⁾	NL	7.8	No	8.4	No
Sulfate	mg/L	P-PL	281	210	No	220	No
Total Dissolved Solids	mg/L	NP-PL	2200	1600	No	1600	No

NOTES:

NL: Statistical limit was not calculated for analytes for which the Sen's Slope methodology was selected

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

1) Baseline data exhibited a statistically significant decreasing trend. Therefore, a trend analysis is used for the determination of SSIs.

Table 10: Statistics Summary Table – TRcpC-16

Analytes	Units	Selected Statistical Method	Statistical Limit	Quarter 2		Quarter 4	
				Compliance Point (5/28/2025)	SSI Determination	Compliance Point (10/6/2025)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	NP-PL	1.6	1.5	No	1.4	No
Calcium, Total Recoverable	mg/L	Trend ⁽¹⁾	NL	4.3	No	3.7	No
Chloride	mg/L	P-PL	545	430	No	450	No
Fluoride	mg/L	P-PL	4.2	3.5	No	3.8	No
pH, Field-Measured	pH units	Trend ⁽¹⁾	NL	8.0	No	8.8	No
Sulfate	mg/L	Trend ⁽¹⁾	NL	210	No	220	No
Total Dissolved Solids	mg/L	Trend ⁽¹⁾	NL	1400	No	1500	No

NOTES:

NL: Statistical limit was not calculated for analytes for which the Sen's Slope methodology was selected

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

1) Baseline data exhibited a statistically significant decreasing trend. Therefore, a trend analysis is used for the determination of SSIs.

Table 11: Statistics Summary Table – TRcpC-17

Analytes	Units	Selected Statistical Method	Statistical Limit	Quarter 1		Quarter 2		Quarter 4	
				Resample Event (2/17/2025)	SSI Determination	Compliance Point (5/28/2025)	SSI Determination	Compliance Point (10/6/2025)	SSI Determination
Appendix III									
Boron, Total Recoverable	mg/L	NP-PL	1.5	1.6	Verified SSI	1.4	No	1.3	No
Calcium, Total Recoverable	mg/L	Trend ⁽¹⁾	NL	--	--	13	No	12	No
Chloride	mg/L	NP-PL	1700	--	--	1200	No	1200	No
Fluoride	mg/L	NP-PL	2.7	2.9	Verified SSI	2.5	No	2.7	No
pH, Field-Measured	pH units	NP-PL	8.0, 8.8	7.6	-- ⁽²⁾	7.7	False-Positive SSI	8.4	No
Sulfate	mg/L	Trend ⁽¹⁾	NL	--	--	260	No	260	No
Total Dissolved Solids	mg/L	P-PL	3571	--	--	2700	No	2600	No

NOTES:

NL: Statistical limit was not calculated for analytes for which the Sen's Slope methodology was selected

P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

1) Baseline data exhibited a statistically significant decreasing trend. Therefore, a trend analysis is used for the determination of SSIs.

2) Field-measured pH is reported for informational purposes. SSI determination for the confirmatory resampling event only applies to parameters identified as potential exceedances from the preceding sampling event.

Table 12: Statistics Summary Table – TRcpcc-18

Analytes	Units	Selected Statistical Method	Statistical Limit	Quarter 2		Quarter 4	
				Compliance Point (5/28/2025)	SSI Determination	Compliance Point (10/6/2025)	SSI Determination
Appendix III							
Boron, Total Recoverable	mg/L	P-PL	0.93	0.77	No	0.67	No
Calcium, Total Recoverable	mg/L	NP-PL	6.2	2.8	No	2.4	No
Chloride	mg/L	NP-PL	380	340	No	350	No
Fluoride	mg/L	Trend ⁽¹⁾	NL	1.2	No	1.4	No
pH, Field-Measured	pH units	Trend ⁽¹⁾	NL	9.3	No	9.8	No
Sulfate	mg/L	NP-PL	250	150	No	150	No
Total Dissolved Solids	mg/L	Trend ⁽¹⁾	NL	1100	No	1100	No

NOTES:

NL: Statistical limit was not calculated for analytes for which the Sen's Slope methodology was selected

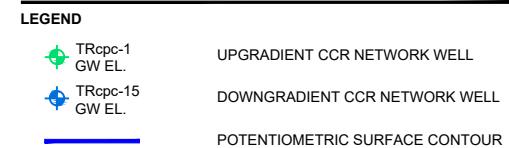
P-PL: Parametric Prediction Limit

NP-PL: Non-parametric Prediction Limit

mg/L: milligrams per liter

1) Baseline data exhibited a statistically significant decreasing trend. Therefore, a trend analysis is used for the determination of SSIs.

Figures



NOTE(S)

1. STATIC WATER LEVELS AT TRpc-1, TRpc-2, TRpc-15, TRpc-16, TRpc-17, AND TRpc-18 WERE MEASURED IN MAY 2025.
2. STATIC WATER ELEVATIONS ARE IN FEET ABOVE SEA LEVEL.
3. POTENTIOMETRIC SURFACE CONTOURS WERE APPROXIMATED BASED ON STATIC WATER ELEVATIONS IN THE NETWORK WELLS SHOWN AND ADDITIONAL SITE WELLS.

0 400 800
SCALE FEET



CLIENT

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PROJECT

ESCALANTE STATION
ACTIVE COAL COMBUSTION RESIDUALS LANDFILL
2025 ANNUAL GROUNDWATER MONITORING REPORT

TITLE

MONITORING WELL LOCATIONS AND STATIC WATER
ELEVATIONS (FIRST SEMI-ANNUAL 2025 SAMPLING EVENT)

PROJECT NO.
31403149.2416

REV.
0

FIGURE
1



LEGEND	
	UPGRADIENT CCR NETWORK WELL
	DOWNGRADIENT CCR NETWORK WELL
	POTENTIOMETRIC SURFACE CONTOUR

NOTE(S)

1. STATIC WATER LEVELS AT TRpc-1, TRpc-2, TRpc-16, TRpc-17, AND TRpc-18 WERE MEASURED IN OCTOBER 2025.
2. STATIC WATER LEVEL AT TRpc-15 WAS MEASURED IN SEPTEMBER 2025.
3. STATIC WATER ELEVATIONS ARE IN FEET ABOVE SEA LEVEL.
4. POTENTIOMETRIC SURFACE CONTOURS WERE APPROXIMATED BASED ON STATIC WATER ELEVATIONS IN THE NETWORK WELLS SHOWN AND ADDITIONAL SITE WELLS.

0 400 800
SCALE FEET



AERIAL IMAGE: GOOGLE EARTH, CAPTURED BY AIRBUS ON JULY 14, 2023.

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PROJECT

ESCALANTE STATION
ACTIVE COAL COMBUSTION RESIDUALS LANDFILL
2025 ANNUAL GROUNDWATER MONITORING REPORT

TITLE

MONITORING WELL LOCATIONS AND STATIC WATER ELEVATIONS (SECOND SEMI-ANNUAL 2025 SAMPLING EVENT)

PROJECT NO.
31403149.2416

REV.
0

FIGURE
2

APPENDIX A

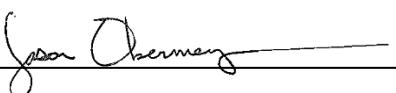
**Alternative Source Demonstration
for Boron and Fluoride in Monitoring
Well TRcpc-17**

CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.94(e)(2)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.94 (40 CFR 257.94), this written demonstration is accurate to the best of my knowledge and has been prepared in accordance with recognized and generally accepted good engineering practices, including the consideration of applicable industry standards, and the requirements of 40 CFR 257.94(e)(2).

WSP USA Inc.



Signature

June 9, 2025

Date of Certification



Jason Obermeyer, PE

Name

24619

New Mexico Professional Engineer Number



REPORT

Alternative Source Demonstration for Boron and Fluoride in Monitoring Well TRcpc-17

*Escalante Generating Station Active Coal Combustion Residuals Landfill
Prewitt, New Mexico*

Submitted to:

Tri-State Generation and Transmission Association, Inc.

1100 W 116th Avenue, Westminster, Colorado 80234

Submitted by:

WSP USA Inc.

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31403149.5855-001-RPT-0

June 9, 2025

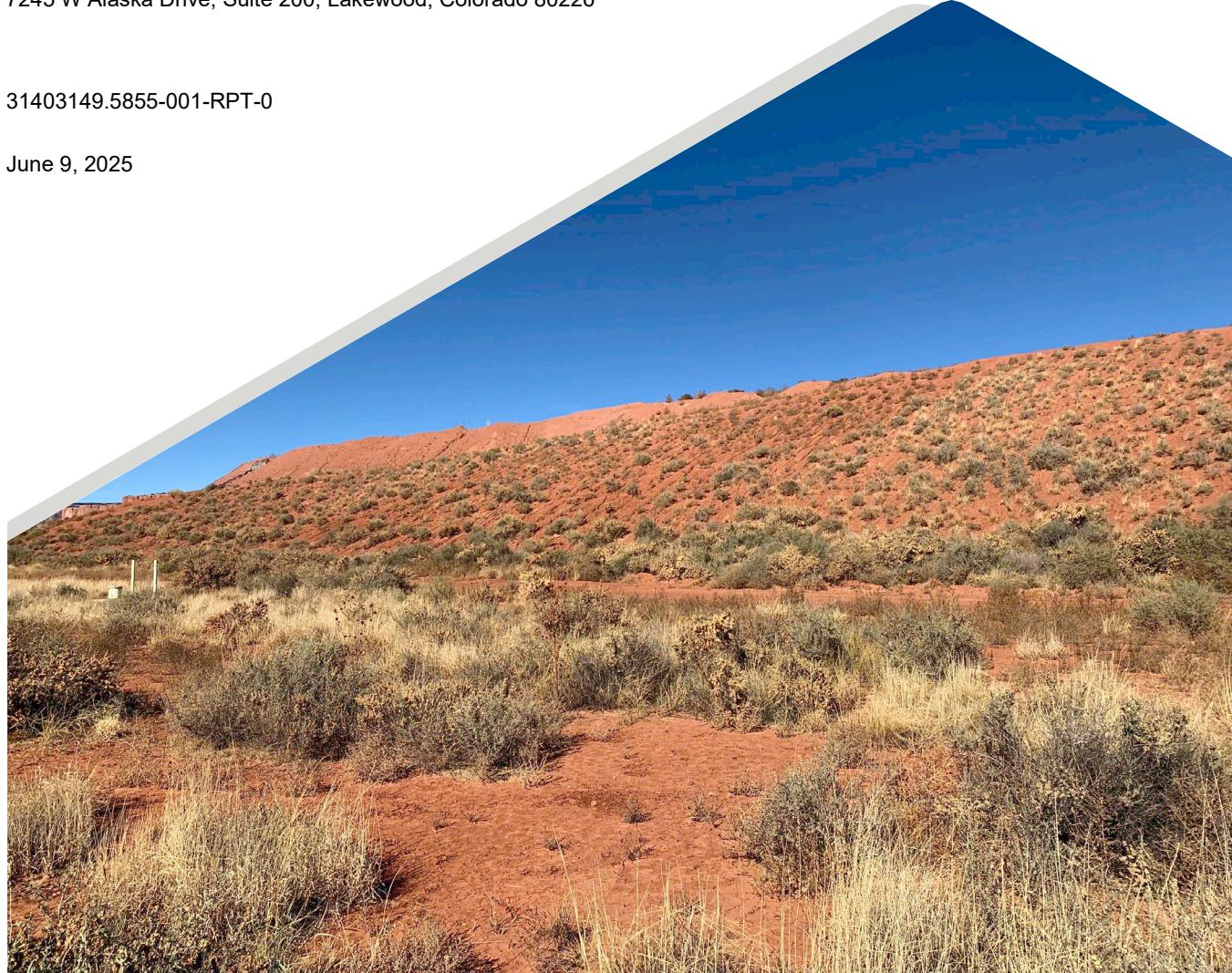


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FIGURES

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Figure 2: Piper Diagram for Network Wells

Figure 3: Time Series of Boron Concentrations in Network Wells

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Figure 5: Time Series of Appendix III Constituents in TRcpc-17

1.0 INTRODUCTION

On behalf of Tri-State Generation and Transmission Association, Inc. (Tri-State), WSP USA Inc. (WSP) performed a statistical evaluation of groundwater monitoring results for the second semi-annual 2024 groundwater detection monitoring event for the active coal combustion residuals (CCR) landfill (the facility) at Escalante Generating Station (the site). The statistical evaluation was performed in accordance with applicable provisions of 40 Code of Federal Regulations (CFR) Part 257, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" as amended (the CCR Rule) and as described in the Groundwater Statistical Method Certification (Golder 2020).

Statistical analyses for the second semi-annual 2024 (October 2024) detection monitoring results for groundwater at downgradient monitoring well TRcpc-17 indicated a potential exceedance for total recoverable boron and fluoride. These potential exceedances were subsequently verified as statistically significant increases (SSIs) following the confirmatory resampling event in February 2025.

Although determination of a verified SSI generally indicates that the groundwater monitoring program should transition from detection monitoring to assessment monitoring, 40 CFR 257.94(e)(2) allows the owner or operator (i.e., Tri-State) 90 days from the date of determining a verified SSI to demonstrate that a source other than the regulated CCR unit caused the SSI or that the SSI is an indication of an error in sampling, analysis, or statistical evaluation or natural variability in groundwater quality that was not fully captured during the baseline data collection period.

WSP's review of the hydrological and geologic conditions at the site indicates that the total recoverable boron and fluoride SSIs at TRcpc-17 are not an indication of impacts from the facility. This alternative source demonstration (ASD) conforms to the requirements of 40 CFR 257.94(e)(2) and provides the basis for concluding that the verified SSIs for total recoverable boron and fluoride at TRcpc-17 are not an indication of an impact from the facility. The following sections provide a summary of the site geology and hydrogeology, WSP's evaluation of analytical results, and lines of evidence demonstrating that an alternative source is responsible for the total recoverable boron and fluoride SSIs at TRcpc-17. More specifically, this report supports the demonstration that the SSIs for total recoverable boron and fluoride at TRcpc-17 (October 2024 and February 2025 samples) are a result of natural variability in groundwater quality that was not fully captured during baseline data collection.

2.0 BACKGROUND

2.1 Site Background

Escalante Generating Station is a 270-megawatt coal-fired electric generation facility located near Prewitt, New Mexico. The generating unit was retired in August 2020. The active CCR landfill at the site contains fly ash, bottom ash, and flue gas desulfurization solids (scrubber solids). These materials were deposited in the facility in a relatively dry condition.

2.2 Site Geology and Hydrogeology

The active CCR landfill is immediately underlain by Quaternary alluvium of variable thickness. The alluvial material is primarily composed of unconsolidated silty sand and clayey sand. The Triassic-aged Chinle Claystone underlies the alluvium and thickens towards the northeast within the boundary of the site, with thicknesses under the active CCR landfill ranging from approximately 75 feet to 205 feet. The Chinle Claystone behaves as a confining unit based on the thickness of the low-permeability claystone and the artesian pressures in the underlying aquifer.

The Triassic-aged Correo Sandstone underlies the Chinle Claystone confining unit. The six monitoring wells in the groundwater monitoring network are each screened in the Correo Sandstone. The groundwater levels in the monitoring wells, which are much higher than the screened interval (i.e., closer to the ground surface), indicate that the groundwater is under confining pressure from the overlying Chinle Claystone confining unit. The groundwater flow direction in the Correo Sandstone bed in the vicinity of the active CCR landfill is generally from west to east, with possible minor northerly or southerly components, as indicated by static groundwater levels in the monitoring wells installed at the site.

The Correo Sandstone is relatively uniform in thickness across the site and dips towards the northeast. According to Moench and Schlee (1967), the Correo Sandstone in the nearby Laguna mining district southeast of the site is composed primarily of quartz and feldspar and firmly cemented with quartz and calcite (CaCO_3). Calcite cement is more prominent in conglomeritic lenses of the Correo Sandstone. The regional interpretations of the Correo Sandstone by Moench and Schlee (1967) generally agree with the borehole logs from Golder (2016), which describe the Correo Sandstone as weakly cemented and having calcareous fragments.

TRcpc-17 is located on the east side of the active CCR landfill and was installed in January 2016. The Chinle Claystone is approximately 120 feet thick at this location. The Correo Sandstone was observed from 142 to 200 feet below ground surface (ft bgs), and the monitoring well is screened from 147 to 190 ft bgs.

2.3 Groundwater Monitoring Network

The monitoring well network for the facility consists of TRcpc-1, TRcpc-2, TRcpc-15, TRcpc-16, TRcpc-17, and TRcpc-18. The locations of the monitoring wells and the active CCR landfill are shown in Figure 1. All six monitoring wells are screened in the Correo Sandstone, which represents the uppermost continuous water-bearing unit (i.e., aquifer) below the active CCR landfill. TRcpc-1 and TRcpc-2 are upgradient of the facility, and TRcpc-15 through TRcpc-18 are downgradient of the facility.

2.4 Summary of Boron and Fluoride in TRcpc-17

The initial baseline sampling for the monitoring wells consisted of eight groundwater samples collected on a monthly frequency from September 2016 through May 2017 at each monitoring well (with an additional sample for TRcpc-1 in August 2017). Following this initial baseline period, the sample frequency was changed to semi-annual. Baseline updates were conducted in 2020 and 2023, resulting in the current baseline period of September 2016 through October 2022 for most well-constituent pairs. During the baseline update, the data set was shifted for some well-constituent pairs by excluding older data so the limits could be established based on a non-trending data set. The resulting data were used to establish intrawell baseline statistical limits for each Appendix III constituent at each monitoring well.

Intrawell baseline statistical limits represent groundwater conditions in each individual monitoring well (USEPA 2009). Samples collected after baseline statistical limits were established are part of the detection monitoring program. Data from the detection monitoring sampling are compared against the statistical limits to assess possible changes in groundwater chemistry at each monitoring well. When the concentration of a given constituent exceeds the statistical limit in two consecutive sampling events, it is considered a verified SSI over the baseline concentration.

2.4.1 Boron

For total recoverable boron in TRcpc-17, a non-parametric prediction limit of 1.5 milligrams per liter (mg/L) was established for the baseline period of September 2016 through October 2022. During the baseline period, boron concentrations in TRcpc-17 ranged between 1.2 and 1.5 mg/L.

Boron concentrations in TRcpc-17 exceeded the non-parametric statistical limit of 1.5 mg/L during the second 2024 semi-annual compliance event in October 2024 (1.6 mg/L) and during the confirmatory resampling event in February 2025 (1.6 mg/L), indicating an SSI over the baseline concentration. During the first 2025 semi-annual compliance event in May 2025, the boron concentration in TRcpc-17 was 1.4 mg/L, which is below the non-parametric statistical limit of 1.5 mg/L.

2.4.2 Fluoride

For fluoride in TRcpc-17, a non-parametric prediction limit of 2.7 mg/L was established for the baseline period of September 2016 through October 2022. During the baseline period, fluoride concentrations in TRcpc-17 ranged between 1.9 and 2.7 mg/L.

Fluoride concentrations at TRcpc-17 exceeded the non-parametric statistical limit of 2.7 mg/L during the second 2024 semi-annual compliance event in October 2024 (2.8 mg/L) and during the confirmatory resampling event in February 2025 (2.9 mg/L), indicating an SSI over the baseline concentration. During the first 2025 semi-annual compliance event in May 2025, the fluoride concentration in TRcpc-17 was 2.5 mg/L, which is below the non-parametric statistical limit of 2.7 mg/L.

3.0 EVALUATION OF POTENTIAL SOURCES

3.1 Facility Construction

The CCR material in the facility is and has historically been deposited in a dry condition, with water used only as needed to control fugitive dust generation. Furthermore, evaporation at the site exceeds precipitation by a significant margin. Based on measurements from 1923 to 2005 maintained by the Western Region Climate Center (2025b), annual pan evaporation averages 73.1 inches at the Los Lunas evaporation station, which is the nearest station to the site in the database (approximately 90 miles southeast of the site). At the same location, the average annual precipitation measured from 1923 to 2010 was 9.0 inches (Western Region Climate Center 2025a). As a result of these combined factors, there is limited interstitial water in the CCR pore spaces that is available to be transmitted downward.

The facility was constructed with a natural lithologic liner. Surficial soils within the facility footprint classify predominantly as clay. Within the current area of CCR placement, the thickness of clay above the Chinle Claystone ranged from 5 to 38 feet (Metric 2006). The presence of the natural lithologic liner further limits the potential for downward transmission of water from within the CCR materials. With minimal interstitial water available to be transmitted as leachate and negligible percolation through the natural lithologic liner, there is little possibility of a release from the facility.

Since there is limited interstitial water in the facility, there is not a way to directly sample porewater or leachate to analyze its characteristics. Therefore, short-term leach testing of four CCR samples collected from the facility was performed by the Synthetic Precipitation Leaching Procedure (SPLP) using USEPA Method 1312 (USEPA 1994), with the leachate analyzed for Appendix III and Appendix IV parameters and major ions. The SPLP simulates the interaction between a solid and meteoric water, which provides a screening-level estimate of effluent water quality that may be representative of CCR contact water. The results of leach tests tend to be sensitive to the

methodology used (e.g., solid-to-solution ratio, nature of the lixiviant, grain size reduction). The SPLP leach test was not used for the analysis of alkalinity, total dissolved solids (TDS), and pH; rather ASTM D3987-85 was used was used for alkalinity and TDS and USEPA Method 9045C was used for pH.

Although leach tests provide an indication of which constituents are most likely to leach from a particular material and their relative abundances, leachate concentrations will exhibit variability related to the specific test methodology used and may not be representative of field-scale conditions. Therefore, the results should not be directly compared to site waters. Instead, Piper diagrams allow for comparisons of relative concentrations in site water and SPLP leachates.

The relative proportions of major ion concentrations in groundwater samples and the SPLP leachates are depicted on a Piper diagram in Figure 2. The October 2024 sample for TRcpc-17 is sodium-chloride type and plots near the earlier samples from TRcpc-17, while the leachates are calcium-sulfate and calcium-sodium sulfate type. If the CCR materials were impacting groundwater at TRcpc-17, a shift toward the signature of the CCR materials would be expected.

On the Piper diagram, the ASTM leachate analysis for alkalinity has been used in lieu of the SPLP leachate analysis with the understanding that the two tests are conducted under different conditions and therefore the results do not represent the same leached sample. This means that the anion ratios presented on the Piper diagram for the CCR samples should be considered approximate. However, it is a reasonable assumption that the alkalinity value from the ASTM leachate will be similar to the value from the SPLP leachate. This assumption is supported by calculated charge balances of 2 to 7% when the ASTM leachate analysis for alkalinity is used in the calculation with the SPLP analysis for the other parameters.

3.2 Travel Time

Even though there is little possibility of a release from the facility because there is limited interstitial water available to be transmitted as leachate and negligible expected percolation through the liner system, the potential for a hypothetical release of CCR-impacted water to be affecting monitored groundwater quality was evaluated by estimating the travel time in the unsaturated/vadose zone using a simplified, yet conservative, analytical method for advective transport. The travel time for potential subsurface impacts to reach the top of the uppermost aquifer is based on the site hydrogeology including:

- Vadose zone thickness of the confining unit of the Chinle Claystone (i.e., the vertical separation between the top of the claystone unit and the top of the uppermost aquifer) of 120 feet based on the TRcpc-17 borehole log (Golder 2016).
- Site-specific saturated hydraulic conductivity and porosity values for the Chinle Claystone of 0.0011 feet per day (4×10^{-7} centimeters per second) and 0.38, respectively, from geotechnical laboratory testing reported by Metric (2004).

For estimation purposes, the estimates of the above properties at the site were used to evaluate travel time of flow and conservative contaminant transport from the top of the claystone to the uppermost aquifer. The conservatively estimated vadose zone travel time through the 120-foot-thick claystone layer for a subsurface release near TRcpc-17 is approximately 114 years. This travel time estimate is conservative since it is based on advective transport, which does not incorporate retardation in transport processes due to sorption or dispersion; it assumes high-moisture conditions and simplification in using saturated hydraulic conductivity to estimate travel time instead of more applicable, lower values of unsaturated hydraulic conductivity; and it omits additional travel

time in the surficial soil unit. In addition, site heterogeneity for variables like bedrock and contaminant properties are not accounted for in this estimate and will also influence travel time; such variations will generally increase travel times.

Given that the active CCR landfill has only been in operation since 2008, this analysis indicates that a hypothetical release of CCR-impacted water would not reach the uppermost aquifer until at least the year 2122 (and likely much later). Therefore, the time travel analysis eliminates the possibility that the cause of the SSIs in TRcpc-17 is the active CCR landfill because it is simply not realistic for a release from the CCR unit to travel to the Correo Sandstone during the time span from 2008 to 2024.

3.3 Uncaptured Natural Variability (Upgradient Groundwater)

TRCpc-1 and TRcpc-2 serve as the upgradient monitoring wells for the facility. While an intrawell approach has been used for determining statistical significance at TRcpc-17, water flowing from upgradient of the unit could lead to changes in the boron concentrations at the downgradient monitoring wells.

Figure 3 and Figure 4 present boron and fluoride concentrations, respectively, between 2015 and 2024 from upgradient and downgradient monitoring wells. Boron concentrations in upgradient monitoring wells TRcpc-1 and TRcpc-2 are typically greater than at TRcpc-17, indicating that upgradient groundwater could be the source of the boron concentration increase that led to the SSI at TRcpc-17. While fluoride concentrations are greater in TRcpc-17 than in upgradient monitoring wells TRcpc-1 and TRcpc-2, fluoride concentrations in other downgradient monitoring wells (TRcpc-16 and TRcpc-15) are greater than at TRcpc-17, demonstrating the potential for variability in fluoride concentrations in downgradient groundwater. The boron and fluoride concentrations for the sample collected from TRcpc-17 for the second quarter 2025 detection monitoring program are below their respective statistical limits. While this does not negate the verified SSIs identified, it does demonstrate that the October 2024 and February 2025 concentrations likely just represent additional variability in the data.

Figure 5 shows time series graphs of Appendix III parameter concentrations for samples collected from TRcpc-17. The October 2024 and February 2025 samples exhibited the highest boron and fluoride concentrations, but other Appendix III parameters generally exhibit a visually decreasing trend. Concentrations of other CCR indicator parameters would likely increase if the facility is the source of the change in boron and fluoride concentrations that led to the identification of the SSIs.

4.0 EVIDENCE OF AN ALTERNATIVE SOURCE

Primary lines of evidence and conclusions drawn from the evidence used to support this ASD are provided in Table 1. In summary, the SSIs identified for total recoverable boron and fluoride in samples collected from TRcpc-17 are not considered to be an indication of a release from the facility.

Table 1: Primary and Supporting Lines of Evidence from ASD Analysis

Key Line of Evidence	Supporting Evidence	Description
Engineering Controls	Lined facility with dry CCR placement and high evaporation rate	There is little possibility of a release from the facility because there is minimal interstitial water available to be transmitted as leachate and negligible expected percolation through the natural lithologic liner.
Hydrogeology	Travel time though the vadose zone	A conservative travel time estimate indicates that a hypothetical release of CCR-impacted water would take at least 114 years to travel through the overlying claystone to the screened unit of TRcpc-17. Therefore, it is not realistic for a release from the CCR unit to reach TRcpc-17 during the time span from 2008 to 2024.
Water Quality	Uncaptured variability/upgradient groundwater	Boron concentrations in TRcpc-17 are less than the boron concentrations in upgradient groundwater monitoring wells (TRcpc-1 and TRcpc-2), indicating that upgradient groundwater could be the source of the increased boron concentrations resulting in the SSI at TRcpc-17. Fluoride concentrations in TRcpc-17 are within the range of those observed at other downgradient monitoring wells, and in some cases lower, demonstrating the potential for variability in fluoride concentrations in downgradient groundwater. This is further supported by boron and fluoride concentrations below their statistical limits in the second quarter of 2025.

5.0 CONCLUSIONS

In accordance with 40 CFR 257.94(e)(2), this ASD has been prepared in response to the identification of verified SSIs for total recoverable boron and fluoride at monitoring well TRcpc-17. This demonstration details the reasons behind WSP's conclusion that the SSIs for total recoverable boron and fluoride at TRcpc-17 are not an indication of groundwater impacts from Escalante Generating Station's active CCR landfill, but rather a reflection of natural variability in concentrations that was not fully captured during the baseline data collection period.

Based on the findings of this demonstration, WSP recommends that Tri-State continue with the detection monitoring program for the active CCR landfill at Escalante Generating Station.

Signature Page



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https://wsponlinenam.sharepoint.com/sites/us-tirstategroundwater/shared%20documents/project%20files/escalante%20CCR/2024%20escalante%20-TRCP-17%20ASD/6%20Deliverables/001-RPT-ASD%20Boron%20and%20Fluoride%20-MW-TRCP-17/rev0/31403149.5855-001-rpt-0-_TRCP-17ASD%20Boron%20and%20Fluoride%20_09Jun25.docx

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Figures


LEGEND

- TRpc-1 GW EL. (Green dot)
- TRpc-15 GW EL. (Blue dot)
- UPGRADIENT CCR NETWORK WELL
- DOWNGRADIENT CCR NETWORK WELL
- POTENTIOMETRIC SURFACE CONTOUR (Blue line)

NOTE(S)

1. GROUNDWATER ELEVATIONS AT TRpc-1, TRpc-2, TRpc-15, TRpc-16, TRpc-17, AND TRpc-18 WERE MEASURED IN OCTOBER 2024 IN UNITS OF FEET ABOVE SEA LEVEL.
2. POTENTIOMETRIC SURFACE CONTOURS WERE CREATED USING WATER LEVEL INFORMATION FROM THE NETWORK WELLS SHOWN AND ADDITIONAL SITE WELLS. CONTOUR INTERVAL IS 5 FEET.

0 400 800
SCALE FEET



AERIAL IMAGE: GOOGLE EARTH, CAPTURED BY AIRBUS ON JULY 14, 2023.

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PROJECT

ESCALANTE STATION
ACTIVE COAL COMBUSTION RESIDUALS LANDFILL
TRCPC-17 BORON AND FLUORIDE ASD

TITLE

MONITORING WELL LOCATIONS AND GROUNDWATER
ELEVATIONS (SECOND SEMI-ANNUAL 2024 SAMPLING EVENT)

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REV.
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FIGURE
1

