
To:	Tennessee Valley Authority Chattanooga, TN	From:	Matthew Dagon, LPG Indianapolis, IN
File:	Updated GWPS and SSLs at the Cumberland Fossil Plant Bottom Ash Pond, Gypsum Storage Area and Dry Ash Stack CCR Unit	Date:	October 2019

**Reference: Update on Statistically Significant Levels (SSLs)
CCR Rule Groundwater Monitoring
Cumberland Fossil Plant, Bottom Ash Pond, Gypsum Storage Area & Dry Ash Stack**

In accordance with the federal regulations for management of coal combustion residuals (CCR Rule; 40 CFR 257, Subpart D), the Tennessee Valley Authority (TVA) is currently conducting Assessment Monitoring at the Bottom Ash Pond, Gypsum Storage Area, and Dry Ash Stack CCR unit at its Cumberland Fossil Plant (CUF) in Cumberland City, Tennessee. The Bottom Ash Pond, Gypsum Storage Area, and Dry Ash Stack are all subject to the CCR Rule with a multi-unit monitoring system.

As required by the CCR Rule (40 CFR 257.95(g)), the owner or operator of a CCR unit shall establish groundwater protection standards (GWPSs) for Appendix IV parameters detected during Assessment Monitoring and determine if one or more Appendix IV parameters are detected at statistically significant levels (SSLs) above their GWPSs. GWPSs for all Appendix IV parameters were originally established and documented in a notice dated October 15, 2018 as required by 40 CFR 257.95(d)(2) and are provided on Table 1.

As part of ongoing Assessment Monitoring, the first semi-annual assessment monitoring event for 2019 occurred February 2-4, 2019, with the additional "resample" event occurring May 6-9, 2019. This technical memorandum presents GWPSs and lower confidence bands (LCBs) that have been updated with data collected during the first semi-annual monitoring event and resample event for 2019, as well as any identified SSLs after incorporating the additional data collected in 2019. The identification of SSLs was performed as a two-step process:

1. Historical sampling results (November 2016 through May 6-9, 2019) for Appendix IV parameters from each downgradient well were compared directly to the GWPS. If all sample concentrations were below the GWPS, no SSLs over the GWPS were identified.
2. Where the direct comparison indicated a concentration above the GWPS, further statistical analysis was performed to identify levels statistically greater than the GWPS, using procedures recommended in the United States Environmental Protection Agency (USEPA) Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 530/R-09-007; March 2009). Comparisons were made against a fixed GWPS via LCBs. For each situation where the parameter concentration was greater than the GWPS in step one, the 99% LCB of the fitted line in that monitoring well was calculated using CCR Rule monitoring data collected from November 2016 through May 6-9, 2019. Note that monitoring well 93-3 was incorporated into the monitoring well network and sampled beginning in June 2018. As recommended in the Unified Guidance, where the 99% LCB exceeds the GWPS at the last sampling event an SSL was identified for the constituent/well pair.

Based on the statistical analysis performed, there continues to be an SSL above the GWPS for cobalt in well CUF-212 and for lithium in well 93-3. These are the same SSLs at the same wells as were previously identified. TVA will continue to conduct groundwater monitoring and reporting pursuant to 40 CFR 257.95.

Reference: Update on Statistically Significant Levels (SSLs) at the Cumberland Fossil Plant - Bottom Ash Pond, Gypsum Storage Area & Dry Ash Stack CCR Unit

**TABLE 1: Statistically Significant Levels (SSLs) Above GWPSs
CUF Bottom Ash Pond, Gypsum Storage Area, & Dry Ash Stack**

Appendix IV Parameter	GWPS (a)	Updated GWPS (b)	Downgradient wells with analytical results above GWPS (c)	Updated LCBs (d)	SSL LCB > GWPS (e)
Antimony (mg/l)	0.006	0.006	None	NA	NA
Arsenic (mg/l)	0.01	0.01	CUF-209	0.0066	No
			CUF-211	0.00896	No
Barium (mg/l)	2	2	None	NA	NA
Beryllium (mg/l)	0.004	0.004	None	NA	NA
Cadmium (mg/l)	0.005	0.005	None	NA	NA
Chromium (mg/l)	0.1	0.1	None	NA	NA
Cobalt (mg/l)	0.006	0.006	CUF-211	0.00588	No
			CUF-212	0.023	Yes
Fluoride (mg/l)	4	4	None	NA	NA
Lead (mg/l)	0.015	0.015	None	NA	NA
Lithium (mg/l)	0.04	0.04	93-3	0.0563	Yes
Mercury (mg/l)	0.002	0.002	None	NA	NA
Molybdenum (mg/l)	0.1	0.1	None	NA	NA
Radium-226+228 (pCi/l)	5	5	None	NA	NA
Selenium (mg/l)	0.05	0.05	None	NA	NA
Thallium (mg/l)	0.002	0.05	None	NA	NA

NA – Not applicable

(a) GWPSs documented in notice dated 10/15/2018.

(b) GWPSs updated as of 09/17/2019 with 2 additional sample results collected on February 2-4, 2019 and May 6-9, 2019.

(c) Downgradient wells with analytical results above GWPS November 2016 through May 6-9, 2019 (per 40 CFR 257.95(b) and (d)).

(d) Most recent value of 99% lower confidence band (LCB) on the mean of Appendix IV groundwater sampling events between November 2016 and May 6-9, 2019. Upper confidence band (UCB) not shown as it is greater than LCB.

(e) SSL: "statistically significant level over GWPS" occurs when the updated LCB value at the last sampling event exceeds the updated GWPS.