AECOM
1300 E. 9th Street, Suite 500
Cleveland, CO 44115

T: +1 (216) 622-2300
aecom.com

Date:
August 17, 2023

Technical Memorandum

Statistical Method Certification

Southern Indiana Gas and Electric Company (SIGECO) dba CenterPoint Energy Indiana South (CEIS)

AB Brown Generating Station Coal Combustion Residual (CCR) Unit: Lined CCR Pond

AECOM Technical Services, Inc. ("Consultant") has been retained by CenterPoint Energy Indiana South (CEIS) to prepare the following certification that the statistical method(s) selected for the evaluation of groundwater monitoring data for the above-referenced coal combustion residuals ("CCR") surface impoundment, identified as the Lined CCR Pond, meets the requirements set out in 40 Code of Federal Regulations (CFR) § 257.93(f).

Background

40 CFR § 257.91 requires the owner or operator of a CCR unit to install a groundwater monitoring system that, relying on site-specific technical information, consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and accurately represent the quality of groundwater passing the waste boundary of the CCR unit.

The owner or operator is required to develop a groundwater monitoring program to include detection monitoring, as defined in 40 CFR § 257.94, to identify any leakage from the unit will be discovered within a timeframe that will not materially delay establishment of an assessment monitoring program, as defined in 40 CFR § 257.95.

Pursuant to 40 CFR § 257.93(f), the owner or operator of the CCR unit must select one of the statistical methods specified in paragraphs (f)(1) through (5) of this section to be used in evaluating groundwater monitoring data for each specified constituent. The statistical test chosen shall be conducted separately for each constituent in each monitoring well and shall comply with the performance standards specified in 40 CFR § 257.93(g). Per 40 CFR § 257.93(f)(6), the owner or operator must obtain a certification from a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the subject CCR unit, including a narrative description of the statistical method selected to evaluate the groundwater monitoring data and the performance standards specified in 40 CFR § 257.91(a), based on the site-specific information specified in 40 CFR § 257.91(b).

Methods

Beginning in the detection-monitoring phase, statistical tests will be performed to evaluate the background data for trends and spatial variability in the Appendix III constituents, to establish background concentrations for those constituents, and to determine if statistically significant increases (SSIs) above background have occurred in the waste boundary wells. Similarly, if assessment monitoring is triggered, additional evaluations will be performed on the background data sets to establish groundwater protection standards (GWPSs) for the Appendix IV constituents that are detected in waste boundary wells, and to determine if the GWPSs have been exceeded at statistically significant levels (SSLs).

The statistical evaluations will follow the methods described in United States Environmental Protection Agency's (EPA) March 2009 Unified Guidance (Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery [RCRA] Facilities). They will be performed using the latest version of EPA's ProUCL, or equivalent commercially available statistical software. As described on EPA's website (https://www.epa.gov/land-research/proucl-software), ProUCL is a comprehensive statistical software package initially developed for a specific site, and subsequently updated by adding new tools and statistical methods to address user feedback. The statistical software package will provide several statistical methods and graphical tools to address many environmental sampling and statistical issues, and will be capable of running environmental data sets with and without non-detect (ND) data. Calculating upper statistical limits is a primary function of the software. Results for statistical intervals are offered with several options and relevant cautions. Other available tests that may apply to groundwater monitoring include single and two-sample hypotheses tests, ANOVA (analysis of variance), regression, trend evaluation, outlier, and goodness-of-fit tests.

As a first step in the evaluation of the groundwater data collected for the CCR unit, time-series graphs will be created, by well and by constituent, that will include all data available from the baseline monitoring events performed prior to placement of the first waste in the CCR Lined Pond (anticipated date is September 1, 2023), and all subsequent compliance monitoring events. The graphed data for the program wells will be assessed for consistency and temporal trends. The graphs will be inspected for the presence of visually identified outliers. If any are noted, the data will be researched; transcription and reporting errors (if any) will be corrected, and data that do not meet appropriate laboratory quality control (QC) criteria will be annotated with an R flag and removed from the data set used for statistical evaluation. In the event of significant natural spatial variability, intrawell comparison of the downgradient data (i.e., within individual wells) may be considered.

In the next step, the statistical software will be used to evaluate the background data sets more completely for the CCR unit, and to develop Background Threshold Values (BTVs) from the pooled data for the background wells. The BTVs, developed from the data collected from background wells in the baseline sampling events, will be considered background concentrations for the purpose of identifying SSIs of Appendix III constituents.

The data will be used to determine the best-fit data statistical distribution for the background data available for each constituent. ProUCL documentation suggests checking distribution models in this order: normal, gamma, lognormal, and nonparametric. The first successful goodness of fit test for a specific distribution determines the preferred data distribution model to be used. The reason for following this order is that gamma distribution formulas are somewhat less sensitive to violations of distribution than lognormal. Therefore, if both gamma and

lognormal tests pass, which is not uncommon, gamma would be the preferred distribution model.

Non-Detect (ND) values occur frequently in groundwater data. In the data collected at the Lined CCR Pond, NDs are results below the laboratory's reporting limit (or practical quantitation limit [PQL] for the analysis). One of the features of ProUCL, and equivalent statistical software packages, is their ability to handle data sets with NDs. Two methods are available: the Kaplan-Meier (KM) method and Regression on Order Statistics (ROS). The KM method uses assumptions about the underlying distribution to represent NDs in the calculation of sample-set statistics, like the sample mean. The ROS method is based on fitting a regression line through the detected values in the data set and using this equation to estimate values below the detection limit, which are then substituted for the ND samples. Theoretically, both KM and ROS are sound methods. However, the KM method is generally preferred because it does not rely on substituted values (values estimated from the regression).

Once the appropriate data distribution is established, along with the appropriate method for handling NDs, then the BTV can be derived as the upper prediction limits (UPLs) for most constituents (pH requires upper and lower prediction limits,) from the pooled baseline data collected from the background wells. In the event that intrawell comparisons are implemented, the BTVs will be established well-by-well, from the baseline samples collected from each of the wells.

Once the BTVs are established for the Appendix III constituents from the data collected during the baseline period, the data collected from waste boundary wells in subsequent rounds (compliance data) will be compared to them. If a compliance value is strictly larger in two or three successive independent samples (depending on data variability), then an SSI will be declared for that constituent in the well sampled.

Limitations

The signature of Consultant's authorized representative on this document represents that to the best of Consultant's knowledge, information, and belief in the exercise of its professional judgment; it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant's experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

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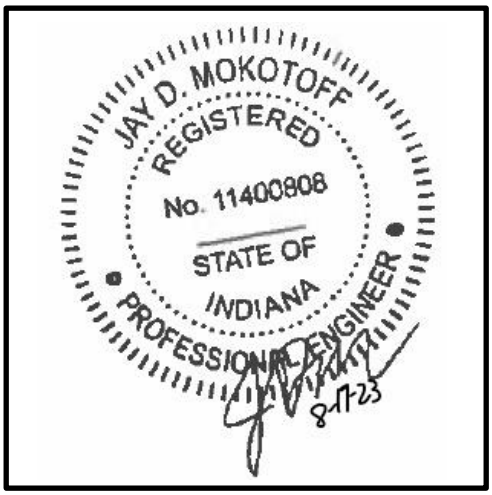
Certification

This Certification Statement documents that the statistical method(s) selected for the evaluation of groundwater monitoring data for the Lined CCR Pond at the A.B. Brown Generating Station meets the requirements set out in 40 CFR § 257.93(f). The Lined CCR Pond is a new CCR surface impoundment, as defined by 40 CFR §257.53. The CCR Rule requires that the specified documentation, assessments, and plans for a new CCR surface impoundment be prepared no later than the first receipt of waste, which is scheduled for no later than September 1, 2023. Pursuant to that requirement, the statistical method certification was completed and issued to SIGECO on August 17, 2023 for placement in the facility operating record.

CCR Unit: Southern Indiana Gas & Electric Company; A.B. Brown Generating Station; Lined CCR Pond

I, Jay Mokotoff, PE, being a Registered Professional Engineer in good standing in the State of Indiana, do hereby certify to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the statistical method(s) selected by the owner or operator for the evaluation of groundwater monitoring data, as specified in 40 CFR § 257.93(f) comply with the performance standards specified in 40 CFR § 257.93(g).

Jay Mokotoff
Printed Name



8/17/2023
Date