



HALEY & ALDRICH, INC.
One Arizona Center
400 E. Van Buren St., Suite 545
Phoenix, AZ 85004
602.760.2450

15 January 2018
File No. 129778-012

Westar Energy, Inc.
818 South Kansas Avenue
Topeka, Kansas 66612

Attention: Jared Morrison – Manager, Water and Waste Programs

Subject: Certification of Statistical Methods – Bottom Ash Settling Pond and Ash Landfill 322
Tecumseh Energy Center, Tecumseh, Kansas

Dear Mr. Morrison:

Westar Energy, Inc. (Westar) operates two existing coal combustion residuals (CCR) management units at the Tecumseh Energy Center located in Tecumseh, Kansas. These CCR management units are referred to as the Bottom Ash Settling Pond and Ash Landfill 322. Pursuant to Code of Federal Regulations Title 40 (40 CFR) Chapter I, Subchapter I, Part 257, Subpart D §257.93 (f)(6)¹, I certify that the selected statistical methods described herein are appropriate for evaluating the groundwater monitoring data for the CCR management area. The statistical methods listed described below were used for the evaluation of the groundwater quality data collected from monitoring wells constructed in accordance with requirements of 40 CFR 257.91 *Groundwater Monitoring Systems* at the Bottom Ash Settling Pond and Ash Landfill 322.

Based on attributes of the water quality dataset, two statistical methods have been used to evaluate water quality data obtained from monitoring wells completed at the Bottom Ash Settling Pond and Ash Landfill 322. The two statistical methods are prediction limits and Parametric Analysis of Variance (ANOVA). A prediction limit procedure is one in which concentration limits [0, PL] for each constituent are established from the distribution of the background data, with a specified confidence level (e.g., 95 percent). The upper endpoint of concentration limits is called the upper prediction limit (UPL). Depending on the background data distribution, parametric or non-parametric prediction limits procedures are used to evaluate groundwater monitoring data using this method. Parametric prediction limits utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the prediction limit. If all the background data are non-detect, a maximum reporting limit may serve as an approximate upper prediction limit.

¹ "The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating the selected statistical method is appropriate for evaluating the groundwater for the CCR management area. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data."

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

This certification and the evaluation to select the statistical procedures were conducted under my direction or supervision according to a system designed to assure that qualified personnel selected the statistical procedure pursuant to 40 CFR 257.93. The certification submitted is, to the best of my knowledge, accurate and complete.

Signed: 

Certifying Engineer

Print Name: Steven F. Putrich
Kansas License No.: PE24363
Title: Senior Associate

