STATISTICAL METHOD CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER
40 CFR 257.93(f)(6)

Montrose Generating Station - 400 SW Highway P, Clinton, MO 64735
Kansas City Power & Light Company
CCR Landfill

40 CFR 257.93 REQUIREMENTS	
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.	✓
(1) A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	Not Selected
(2) An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	Not Selected
(3) A tolerance or prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	✓
(4) A control chart approach that gives control limits for each constituent.	Not Selected
(5) Another statistical test method that meets the performance standards of paragraph (g) of this section.	Not Selected
(6) The owner or operator of the CCR unit 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 CCR management area. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data.	✓
40 CFR 257.93(g) Any statistical method chosen under paragraph (f) of this section shall comply with the following performance standards, as appropriate, based on the statistical test method used:	✓
(1) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of constituents. Normal distributions of data values shall use parametric methods. Non-normal distributions shall use non-parametric methods. If the distribution of the constituents is shown by the owner or operator of the CCR unit to be inappropriate for a normal theory test, then the data must be transformed or a distribution-free (non-parametric) theory test must be used. If the distributions for the constituents differ, more than one statistical method may be needed.	✓
(2) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a groundwater protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparison procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts.	Not Appropriate
(3) If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. The parameter values shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	Not Appropriate
(4) If a tolerance interval or a predictional interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	✓
(5) The statistical method must account for data below the limit of detection with one or more statistical procedures that shall be at least as effective as any other approach in this section for evaluating groundwater data. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	✓
(6) If necessary, the statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	✓

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NARRATIVE DESCRIPTION OF SELECTED STATISTICAL METHOD

Intrawell prediction limit analysis with retesting was selected as the statistical method for evaluating groundwater monitoring data for each specified constituent. Intrawell prediction limits compare concentrations of each specified constituent to historical concentrations of that specified constituent within the same monitoring well. Significant upward changes in the concentrations over time identify a statistical result above the prediction limit known as a statistically significant increase (SSI) over background concentrations.

The distribution of the data will be calculated by applying the Shapiro-Wilk or Shapiro-Francia test for normality, or to the Ladder of Powers (Helsel & Hirsh, 1992) for transformed data. A parametric prediction limit will be constructed for data determined to have a normal or transformed normal distribution. If less than 15 percent of the background data observations are less than the reporting limit (non-detects), these will be replaced with one half of the reporting limit prior to running the analysis. If more than 15 percent but less than 50 percent of the background data are less than the reporting limit, the data's sample mean and sample standard deviation will be adjusted according to the method of Cohen or Aitchison. A non-parametric prediction limit will be calculated for data not transformed normal or containing greater than 50 percent non-detect results. Poisson based prediction limits are an alternative method when greater than 90 percent of the background data is less than the reporting limit.

LIMITATIONS

SCS Engineers has been retained by Kansas City Power & Light Company to select and certify appropriate statistical methodology to meet the requirements of 40 CFR 257.93(f). The signature of the authorized representative on this document represents that to the best of his knowledge, information, and belief in the exercise of his professional judgement in accordance with the standard of practice, it is his professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by him are made on the basis of his experience, qualifications, and professional judgement and are not to be construed as warranties or guaranties. In addition, opinions relating to regulatory, environmental, geologic, and geotechnical conditions interpretations 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.

QUALIFIED PROFESSIONAL ENGINEER'S CERTIFICATION

I, Douglas L. Doerr, being a licensed Professional Engineer in the State of Missouri, hereby certify that the selected statistical method as described herein is appropriate for evaluating the groundwater monitoring data for the CCR Landfill at the Montrose Generating Station and is in accordance with generally accepted good engineeringpractices.

Douglas L. Doerr

Digitally signed by Douglas L. Doerr
DN: cn=Douglas L. Doerr, o=SCS Engineers, ou, email=ddoerr@scsengineers.com, c=US
Date: 2017.10.12 16:21:17 -05'00'