



Stantec Consulting Services Inc.
11687 Lebanon Road, Cincinnati OH 45241-2012

October 17, 2017
File: 175534018
Revision 0

Indiana-Kentucky Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

**RE: Selection of Statistical Procedures
Groundwater Sampling and Analysis Program
CCR Landfill, West Boiler Slag Pond, and Landfill Runoff Collection Pond
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana**

1.0 PURPOSE

This letter documents Stantec's certification of the statistical procedures to be used for evaluating groundwater monitoring data selected by Applied Geology and Environmental Science, Inc. (AGES) for the Indiana-Kentucky Electric Corporation (IKEC) Clifty Creek Station's CCR Landfill, West Boiler Slag Pond (WBSP), and Landfill Runoff Collection Pond (LRCP). The EPA Final CCR Rule requires owners or operators of CCR landfills and surface impoundments to install a groundwater monitoring system as per 40 CFR 257.91 and to develop a groundwater sampling and analysis program in accordance with 40 CFR 257.93.

2.0 GROUNDWATER SAMPLING AND ANALYSIS REQUIREMENTS - STATISTICAL METHOD

The initial timeframes listed in 40 CFR 257.90(b) for existing CCR landfills and existing CCR surface impoundments states:

No later than October 17, 2017, the owner or operator of the CCR unit must be in compliance with the following groundwater monitoring requirements:

- (i) Install the groundwater monitoring system as required by §257.91;
- (ii) Develop the groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by §257.93;
- (iii) Initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient well as required by §257.94(b); and



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- (iv) Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in appendix III of this part as required by §257.94.

The owner or operator of the CCR unit must select one of the statistical methods specified in 40 CFR 257.93(f)(1) through (5) 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.
- (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.
- (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.
- (5) Another statistical test method that meets the performance standards of paragraph (g) of this section.

As stated in 40 CFR 257.93(f), 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.

3.0 SUMMARY OF FINDINGS

Stantec personnel reviewed AGES' letter to IKEC dated October 10, 2017, *Re: Selection of a Statistical Method, CCR Groundwater Monitoring Program, Indiana Kentucky Electric Corporation*



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(IKEC), Clifty Creek Station-Madison, Indiana to demonstrate compliance with 40 CFR 257.93(f) as described above in Section 2.0 of this certification letter.

Under "Description of Facility," AGES states that OVEC has collected the required minimum of eight independent samples from each background and downgradient well at each CCR unit and analyzed each sample for the constituents listed in Appendix III and Appendix IV of the CCR rule in accordance with §257.94(b).

AGES continues in "Selection of a Statistical Method: 95% Upper Tolerance Limit" to select §257.93(f)(3) as the preliminary statistical method for evaluating the background groundwater monitoring data:

§257.93(f)(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.

"...because no appropriate historical data is available from the three CCR units other than the eight rounds of data collected between December 2015 and September 2017, a 95% Upper Tolerance Limit (UTL) method was selected as the best method for comparison to background conditions" (AGES, 2017)

"Tolerance intervals are statistical ranges typically constructed from on-site background data. Tolerance limits define the range of data that fall within a specified percentage with a specified level of confidence. The upper tolerance limit has been commonly used to establish a background threshold value. A UTL is designed to contain, but not exceed, a large fraction (that is, 95%, 99%) of the possible background concentrations, thus providing a reasonable upper limit on what is likely to be observed in background. The fraction to be contained or 'covered' by the limit is the coverage parameter, and must be specified along with a desired confidence level. Tolerance limits explicitly account for the degree of variation in the background population and the size of the sample of measurements used to construct the limit." (AGES, 2017)

As specified under §257.90(b)(ii) and §257.93(f)(6), the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area based on the



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statistical methods defined in §257.93(f)(1) through (5). However, analyses of the background groundwater monitoring data are ongoing. Stantec reserves the right to reevaluate the selected statistical method based on further evaluation of the characteristics of the data recently received.

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stan A. Harris, being a Professional Engineer in good standing in the State of Indiana, do hereby certify, to the best of my knowledge, information, and belief that the statistical methods in this selection letter for evaluating the groundwater monitoring data for the IKEC Clifty Creek Station's CCR Landfill, West Boiler Slag Pond, and Landfill Runoff Collection Pond meet the requirements described in 40 CFR 257.93(f).

SIGNATURE



DATE

10/17/17

ADDRESS:

Stantec Consulting Services Inc.
11687 Lebanon Road
Cincinnati, Ohio 45241

TELEPHONE:

(513) 842-8200

ATTACHMENTS: Applied Geology and Environmental Science, Inc. (AGES) (2017). Letter to Indiana Kentucky Electric Corporation, dated October 10. Re: Selection of a Statistical Method, CCR Groundwater Monitoring Program, Indiana Kentucky Electric Corporation (IKEC), Clifty Creek Station-Madison, Indiana.



October 10, 2017

Mr. Gabe Coriell
Indiana Kentucky Electric Corporation
3932 U.S. Route 23
Piketon, Ohio 45661

**RE: Selection of a Statistical Method
CCR Groundwater Monitoring Program
Indiana Kentucky Electric Corporation (IKEC) Clifty Creek Station-Madison,
Indiana**

Dear Mr. Coriell:

On behalf of Applied Geology and Environmental Science (AGES), Inc., we would like to thank you for the opportunity to submit this letter report.

BACKGROUND

On December 19, 2014, the U.S.EPA issued their final Coal Combustion Residuals (CCR) regulation which regulates CCR as a non-hazardous waste under Subtitle D of RCRA and became effective six (6) months from the date of its publication (April 17, 2015) in the Federal Register.

All CCR landfills and CCR surface impoundments (including inactive impoundments unless they close within three (3) years from the promulgation date of the rule) are subject to new, and typically more stringent than current state requirements, for groundwater monitoring and, if necessary, corrective action. Within 30 months after the date of publication (April 17, 2015) in the Federal Register, all existing CCR landfills and existing CCR surface impoundments must have installed groundwater monitoring systems, initiated a groundwater detection monitoring program, and begun evaluating groundwater monitoring data to evaluate groundwater quality at each CCR unit.

Description of Facility

The Clifty Creek Station, located in Madison, Indiana is a 1,304-megawatt (MW) coal-fired generating plant operated by the Indiana-Kentucky Electric Corporation (IKEC), a subsidiary of Ohio Valley Electric Corporation (OVEC). The Clifty Creek Station has six 217.26-MW generating units and has been in operation since 1955. Beginning in 1955, ash products were sluiced to disposal ponds located in the plant site (not all ash product is sluiced at Clifty). During

the course of plant operations, CCRs have been managed and disposed of in various units at the station.

There are three (3) CCR units at the Clifty Creek Station:

- Type I Residual Waste Landfill (Landfill);
- Landfill Runoff Collection Pond (LRCP); and
- West Boiler Slag Pond (WBSP).

In accordance with §257.94(b) of the CCR Rule, prior to October 17, 2017 (30 months after the date of publication in the Federal Register) IKEC has collected the required minimum of eight independent samples from each background and downgradient well at each CCR unit and analyzed each sample for the constituents listed in Appendix III and Appendix IV of the CCR rule.

SELECTION OF A STATISTICAL METHOD: 95% UPPER TOLERANCE LIMIT

In accordance with §257.93 (f) of the CCR Final Rule, the owner or operator of a CCR unit must select one of the statistical methods specified in paragraphs (f)(1) through (f)(5) of the rule to be used in evaluating groundwater monitoring data for each specified constituent. The chosen statistical method will comply with the performance standards listed in §257.93 (g)(1) through (6).

Based on an evaluation of the site history and of the geologic setting of each unit, and because no appropriate historical data is available from the three CCR units other than the eight rounds of data collected between December 2015 and September 2017, a 95% Upper Tolerance Limit (UTL) method was selected as the best method for comparison to background conditions. This procedure complies with §257.93(f)(3), which recommends 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.

Tolerance intervals are statistical ranges typically constructed from on-site background data. Tolerance limits define the range of data that fall within a specified percentage with a specified level of confidence. The upper tolerance limit has been commonly used to establish a background threshold value. A UTL is designed to contain, but not exceed, a large fraction (that is, 95%, 99%) of the possible background concentrations, thus providing a reasonable upper limit on what is likely to be observed in background. The fraction to be contained or 'covered' by the limit is the coverage parameter, and must be specified along with a desired confidence level. Tolerance limits explicitly account for the degree of variation in the background population and the size of the sample of measurements used to construct the limit.

Mr. Gabe Coriell
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The 95% UTL Method is one of the methods recommended for use in the U.S. EPA publication *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (U.S. EPA, March 2009). ProUCL version 5.1 (USEPA 2013), a comprehensive statistical software package developed by the U.S. EPA for computing statistical intervals using recommended tools and statistical methods, will be used in the detection monitoring program to calculate the 95% UTL with 95% coverage for each of the downgradient wells for each of the three CCR units.

CLOSING

If you have any questions or comments regarding this change order, please feel free to contact us at 412-264-6453. Thank you for again the opportunity to be of service.

Sincerely,

APPLIED GEOLOGY AND ENVIRONMENTAL SCIENCE, INC.



Diane E. Miller, PG
Senior Geologist



Robert W. King, PG
Chief Hydrogeologist