



**INDIANA-KENTUCKY ELECTRIC CORPORATION**

3932 U. S. Route 23  
P. O. Box 468  
Piketon, Ohio 45661  
740-289-7200

WRITER'S DIRECT DIAL NO:  
740-289-7259

December 7, 2023

**Delivered Electronically**

Mr. Brian Rockensuess  
Commissioner  
Indiana Department of Environmental Management  
100 N. Senate Avenue  
Mail Code 50-01  
Indianapolis, IN 46204-2251

**Re: Indiana-Kentucky Electric Corporation  
December 2023 Semi-Annual Selection of Remedy Report  
for Clifty Creek Station West Boiler Slag Pond**

Dear Mr. Rockensuess:

As required by 40 CFR 257.106(h)(9), the Indiana-Kentucky Electric Corporation (IKEC) is providing notification to the Commissioner of the Indiana Department of Environmental Management that the first Semi-annual Selection of Remedy has been completed in compliance with 40 CFR 257.97(a) for the Clifty Creek Station's West Boiler Slag Pond (WBSP). The intent of the report is to provide an update on the progress of selecting a remedy for confirmed Appendix IV SSIs above the groundwater protection standard in the groundwater at the WBSP. The report has been placed on the facility's operating record in accordance with 40 CFR 257.105(h)(12), as well as, on the company's publicly accessible internet site in accordance with 40 CFR 257.107(h)(9), which can be at <http://www.ovec.com/CCRCCompliance.php>.

If you have any questions, or require any additional information, please call me at (740) 289-7259.

Sincerely,

A handwritten signature in black ink that reads "Jeremy Galloway".

Jeremy Galloway  
Environmental Specialist

JDG:tlf

# **Semi-Annual Report on the Progress of Remedy Selection**

**40 CFR 257.97(a)**

West Boiler Slag Pond

Clifty Creek Station

Madison, Indiana

December 2023

Prepared by: Indiana-Kentucky Electric Corporation

3932 U.S. Route 23

Piketon, OH 45661



# TABLE OF CONTENTS

---

1	Introduction .....	3
1.1	Regulatory Background.....	3
1.2	Report Contents.....	4
2	Site Background .....	4
2.1	Unit Specific Geology and Hydrogeology.....	4
2.2	Potential Receptor Review.....	4
3	Groundwater Assessment Monitoring Program.....	5
3.1	Groundwater Monitoring Well Network .....	5
3.2	Groundwater Characterization .....	5
4	Assessment of Corrective Measures.....	6
4.1	Planned Source Control Measures.....	6
4.2	Potential Remedial Technologies.....	7
5	Selection of Remedy: Current Progress .....	8
5.1	Planned Work.....	8

# 1 INTRODUCTION

---

In accordance with 40 CFR § 257.97(a), the Indiana-Kentucky Electric Corporation (IKEC) has prepared this Semi-Annual report to document progress toward remedy selection, design and implementation of corrective actions associated with groundwater monitoring exceedances at the Clifty Creek Station's West Boiler Slag Pond (WBSP). This report summarizes activities during the period of October 27, 2023, through December 1, 2023. Updates to the report will be published semi-annually, until such time a remedy has been selected. Upon selection, a final report will be prepared describing the selected remedy and how it meets the standards specified in the rule.

## 1.1 REGULATORY BACKGROUND

On December 19, 2014, the United States Environmental Protection Agency (U.S. EPA) issued their final Coal Combustion Residuals (CCR) regulation which regulates CCR as a non-hazardous waste under Subtitle D of Resource Conservation and Recovery Act (RCRA) and became effective six (6) months from the date of its publication (April 17, 2015) in the Federal Register, referred to as the "CCR Rule." The rule applies to new and existing landfills, and surface impoundments used to dispose of or otherwise manage CCR generated by electric utilities and independent power producers. The rule includes requirements for monitoring groundwater and assessing corrective measures if constituents listed in Appendix IV of the rule are detected in groundwater samples collected from downgradient monitoring wells at Statistically Significant Levels (SSL) greater than the established Groundwater Protection Standard (GWPS).

In May 2023, IKEC initiated an Assessment of Corrective Measures (ACM) at the Clifty Creek WBSP as a result of a confirmed SSL of Appendix IV constituent Arsenic in monitoring wells WBSP-15-08 and WBSP-15-09 during September 2022 Assessment Monitoring Activities and wells WBSP-15-07, WBSP-15-08 and WBSP-15-09 during March 2023 Assessment Monitoring Activities, as required by 40 CFR § 257.97(a). In accordance with 40 CFR § 257.96(a), IKEC prepared an ACM report for the Clifty Creek WBSP. It was placed in the facility's operating record and uploaded to IKEC's CCR Rule Compliance internet site on October 27, 2023. The ACM Report provides an assessment of the effectiveness of potential corrective measures in achieving the criteria provided in 40 CFR § 257.96(c). Multiple strategies were evaluated to address groundwater exhibiting concentrations of Arsenic above the GWPS, with three (3) technically feasible options identified. These options require the removal of free water from the pond, followed by the execution of an engineered cap and closure of the WBSP facility, and are as follows:

- Monitored Natural Attenuation (MNA);
- In-Situ Chemical Stabilization (Oxygenation); and
- Conventional Vertical Well System (Groundwater Extraction & Treatment) (Ex-Situ).

Semi-annual reports are required pursuant to 40 CFR § 257.97(a) to document progress toward remedy selection and design. The CCR Rule provides flexibility for additional field investigation, which is still ongoing, data analysis and consideration prior to the selection of a remedy. IKEC will continue to review new data as it becomes available from active site evaluation and implement changes to the groundwater monitoring and corrective action program as necessary to maintain compliance with the rule.

## 1.2 REPORT CONTENTS

This first semi-annual progress report provides regulatory background, an overview of site characteristics and ACM findings, and summarizes activities supporting the selection and implementation of a remedy during the period of October 27, 2023 through December 1, 2023.

## 2 SITE BACKGROUND

---

The Clifty Creek Station, located in Madison, Indiana, is a 1.3-gigawatt coal-fired generating plant operated by IKEC, a subsidiary of the Ohio Valley Electric Corporation (OVEC). The Clifty Creek Station has six (6) 217.26-MW generating units and has been in operation since 1955. Ash products were sluiced to disposal ponds located in the plant site since it began operation. During the course of plant operations, CCRs have been managed and disposed of in various units at the station, including the WBSP, which was a settling facility for sluiced boiler slag produced at the plant.

### 2.1 UNIT SPECIFIC GEOLOGY AND HYDROGEOLOGY

The WBSP is formed by natural grade to the north, east and west, and a southern dike that runs along the bank of the Ohio River. The Devil's Backbone borders the northern side of the WBSP. Based on logs from soil borings drilled during well installation at the unit, the WBSP is underlain by alluvial deposits consisting of layers of silty clay, sandy silt and silty sand ranging from approximately 15 feet below ground surface (bgs) on the northwest side of the WBSP (closest to the Devil's Backbone) to approximately 90 feet bgs on the southeast side of the WBSP (closest to the Ohio River).

Well borings indicated that a layer of gray silt with fine sand, becoming more coarse-grained further to the north & northeast, located at an elevation of approximately 420 feet mean sea level (msl) is the uppermost aquifer beneath the WBSP.

### 2.2 POTENTIAL RECEPTOR REVIEW

IKEC completed an assessment of the proximity of public and private drinking water supplies to the WBSP in response to SSLs above the GWPS. It was determined that the withdrawal wells designated by the Indiana Department of Natural Resources (IDNR) as

drinking water wells within a one-mile radius are not hydraulically connected to the groundwater at the WBSP facility or are located upgradient from the facility.

### 3 GROUNDWATER ASSESSMENT MONITORING PROGRAM

---

Groundwater assessment monitoring for the Clifty Creek WBSP is conducted in accordance with 40 CFR § 257.95.

#### 3.1 GROUNDWATER MONITORING WELL NETWORK

In compliance with 40 CFR § 257.91, the CCR groundwater monitoring network for the WBSP consists of the following 13 wells:

- CF-15-04 (Background);
- CF-15-05 (Background);
- CF-15-06 (Background);
- WBSP-15-01 (Upgradient);
- WBSP-15-02 (Upgradient);
- WBSP-15-03 (Upgradient);
- WBSP-15-04a (Downgradient);
- WBSP-15-05a (Downgradient);
- WBSP-15-06a (Downgradient);
- WBSP-15-07 (Downgradient);
- WBSP-15-08 (Downgradient);
- WBSP-15-09 (Downgradient); and
- WBSP-15-10 (Downgradient).

Additionally, four (4) monitoring wells that were installed as part of the additional assessment activities for the WBSP were added to the CCR groundwater monitoring network for the WBSP as follows:

- WBSP-23-01 (Downgradient/Interim);
- WBSP-23-02 (Downgradient/Interim);
- WBSP-23-03 (Downgradient/Interim); and
- WBSP-23-04 (Downgradient/Interim).

#### 3.2 GROUNDWATER CHARACTERIZATION

Groundwater detection monitoring was first conducted at the Clifty Creek WBSP in 2018; the first round of assessment monitoring was performed in September 2022. Arsenic, an Appendix IV constituent, was detected and confirmed to exceed the GWPS of 10 µg/L at wells WBSP-15-08 and WBSP-15-09 during September 2022 Assessment Monitoring Activities and wells WBSP-15-07, WBSP-15-08 and WBSP-15-09 during

March 2023 Assessment Monitoring Activities. In response, IKEC was required to characterize the extent of the release, pursuant to 40 CFR § 257.95(g)(1), and installed interim boundary groundwater monitoring wells WBSP-23-01, WBSP-23-02, WBSP-23-03 and WBSP-23-04.

To meet the requirement of 40 CFR § 257.95 (d)(1), IKEC attempted to install four (4) wells at the facility boundary in the direction of contaminant migration. However, the property boundary in this area of the facility is heavily wooded and could not be safely accessed by a drilling rig without cutting down several trees. As the facility is located within the habitat of the Indiana Bat, the Programmatic Biological Opinion (BO) for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat prepared by U.S. Fish and Wildlife Service (U.S. FWS) is applicable. Per this regulation, tree clearing in Indiana can only occur during inactive bat season. As the current inactive bat season is from October 1 to March 31 annually, IKEC could not clear trees and safely access the area along the Ohio River with a drilling rig until after October 1, 2023. Therefore, monitoring wells could not be installed along the property boundary within the timeframe required for the ACM Report. Property boundary wells are planned to be installed in early 2024, pending weather conditions and the availability of a licensed driller.

## 4 ASSESSMENT OF CORRECTIVE MEASURES

---

In accordance with 40 CFR § 257.96(a), IKEC prepared an ACM report for the Clifty Creek WBSP and placed it in the facility's operating record, as well as uploaded it to IKEC's CCR Rule Compliance internet site on October 27, 2023. The ACM Report provided an assessment of the effectiveness of potential corrective measures in achieving the criteria provided in 40 CFR § 257.96(c).

### 4.1 PLANNED SOURCE CONTROL MEASURES

Per 40 CFR § 257.96(a), the objectives of the corrective measures evaluated in this ACM Report are "to prevent further releases, to remediate any releases, and to restore affected area to original conditions." As required in 40 CFR § 257.97(b), corrective measures, at minimum, must:

- (1) Be protective of human health and the environment;*
- (2) Attain the groundwater protection standard as specified pursuant to § 257.95(h);*
- (2) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment;*

*(5) Comply with standards for management of wastes as specified in § 257.98(d).*

During the ACM development process, several in-situ and ex-situ remedial technologies were evaluated to address Arsenic in groundwater at the WBSP, and screened against evaluation criteria requirements in 40 CFR § 257.96(c). The three (3) technologies that appear to be most technically feasible, and therefore most likely for selection as a remedy are:

- Monitored Natural Attenuation (MNA);
- In-Situ Chemical Stabilization (Oxygenation); and
- Conventional Vertical Well System (Groundwater Extraction & Treatment) (Ex-Situ).

As previously noted, these options require removal of free water from the pond, followed closure by removal of boiler slag from the WBSP. IKEC is committed to continued compliance with the requirements and timeframes of the CCR Rule, and will close the Clifty WBSP in accordance with 40 CFR § 257.102. IKEC is continuing to work with the site's Qualified Professional Engineer to dewater the WBSP, refine the designs associated with closure by removal, and to implement control mechanisms necessary to prepare for the safe closure of the WBSP.

The initial activities described above are anticipated to assist in the reduction of the potential for releases and migration of CCR constituents. Groundwater assessment monitoring as required by 40 CFR § 257.96(b) will continue until a remedy is selected and implemented. The monitoring will be conducted to track changes in groundwater conditions as a result of these operational changes. These data will also be considered in the selection and design of a remedy in accordance with 40 CFR § 257.97.

#### 4.2 POTENTIAL REMEDIAL TECHNOLOGIES

As a source control measure, the Clifty Creek WBSP will be closed in accordance with CFR § 257.102 prior to implementation of further groundwater remediation efforts. In addition to source control measures, three primary strategies were identified to address groundwater exhibiting concentrations of Arsenic above the GWPS, including:

- Monitored Natural Attenuation (MNA);
- In-Situ Chemical Stabilization (Oxygenation); and
- Conventional Vertical Well System (Groundwater Extraction & Treatment) (Ex-Situ).

The ACM report titled "Assessment of Corrective Measures Report, West Boiler Slag Pond," which is available on IKEC's publicly accessible internet site, provides a more detailed description of these corrective measures. The effectiveness of each potential



corrective measure was assessed in accordance with 40 CFR § 257.96 (c). The options above are considered technically feasible, and appropriate for groundwater remediation efforts at the WBSP.

## 5 SELECTION OF REMEDY: CURRENT PROGRESS

---

As noted in the ACM Report, IKEC determined that an effective method for source control would be to leave the CCR material in place and install a CCR compliant cap system to prevent future infiltration of stormwater. However, IKEC has elected to close the WBSP by removal of the boiler slag, which will be performed under the direction of a Qualified Professional Engineer. IKEC has initiated closure of the WBSP in accordance with the CCR Rule, Part A deadline of October 17, 2023.

IKEC's hydrogeologist conducted the semi-annual groundwater sampling and testing during this report period. In addition to sampling the monitoring wells in the CCR groundwater monitoring network, the sentinel wells installed to aid in ACM activities were also sampled. A total of 17 wells (13 network and 4 interim boundary) were sampled near the WBSP and the results will be summarized in the 2023 Groundwater Monitoring and Corrective Action Report. In addition to the semi-annual monitoring, IKEC's hydrogeologist also collected monthly depth-to-groundwater readings at wells in the area of the WBSP.

### 5.1 PLANNED WORK

IKEC's consultant or hydrogeologist will continue to sample and test all of the monitoring wells as part of the semi-annual requirement.

Per 40 CFR § 257.95 (d)(1), IKEC's hydrogeologist will install at least additional monitoring wells at the facility boundary sufficient to determine if groundwater is leaving the site at levels above the GWPS when access to the area can be safely obtained in accordance with U.S. FWS regulations, and pending weather conditions and the availability of a licensed driller.

IKEC's hydrogeologist will continue to collect monthly depth-to-groundwater readings at wells in the area of the WBSP. This will help to better understand the dynamic nature of groundwater flow at the WBSP, which is a function of unique site geologic formations, and ensure the remedy selected is appropriate.

IKEC's hydrogeologist will continue to develop the Time-Series evaluations to determine if the concentrations of Arsenic are increasing, decreasing, or are asymptotic.

IKEC's hydrogeologist will continue to evaluate the effects of flood events on the site.

IKEC and their CCR hydrogeologist will continue to evaluate the technology options identified in the ACM, and engage the site's Qualified Professional Engineer to ensure the alternatives meet the criteria set forth in 40 CFR 257.97.

To evaluate whether In-Situ Chemical Stabilization (Oxygenation) is a technically feasible option to address Arsenic in groundwater, IKEC will conduct a pilot test for the technology at the WBSP. To support this approach, IKEC's hydrogeologist is preparing a workplan for the installation of piezometers at the unit that will be used for the injection of oxygen or oxygenating compounds into the uppermost aquifer. After installation, the piezometers will be developed and sampled. The results from sampling will be evaluated to develop a work plan for the In-Situ Chemical Stabilization (Oxygenation) pilot test at the WBSP. Installation of piezometers is planned for the first quarter of 2024. The pilot test is planned to be completed in the second quarter of 2024. The results of the pilot test will be used to evaluate whether this option can be used to address Arsenic in groundwater at the WBSP.

IKEC will submit the next progress report by June 2, 2024.

A final report will be prepared after the remedy is selected. This report will describe the proposed solution and how it meets the standards specified in 40 CFR § 257.97(b) and 257.97(c). Recordkeeping requirements specified in 40 CFR § 257.105(h), notification requirements specified in 40 CFR § 257.106(h), and internet requirements specified in 40 CFR § 257.107(h) will be complied with as required by 40 CFR § 257.96(f).