



**INDIANA-KENTUCKY ELECTRIC CORPORATION**

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

WRITER'S DIRECT DIAL NO:  
740-897-7768

June 1, 2020

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

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

Dear Mr. Pigott:

**Re: Indiana-Kentucky Electric Corporation  
2020 Semi-Annual Selection of Remedy Report**

As required by 40 CFR 257.106(h)(9), the Indiana-Kentucky Electric Corporation is providing notification to the Commissioner of the Indiana Department of Environmental Management that the first Semi-Annual Selection of Remedy report has been completed in compliance with 40 CFR 257.97(a) for Clifty Creek Station's Landfill Runoff Collection Pond (LRCP). The intent of the report is to provide a six-month update on the progress of selecting a remedy for confirmed Appendix IV SSIs above the groundwater protection standard in the groundwater at the LRCP. The report has been placed in 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 viewed at <https://www.ovec.com/CCRCCompliance.php>.

If you have any questions, or require any additional information, please call me at (740) 897-7768.

Sincerely,

A handwritten signature in black ink that reads "Tim Fulk".

Tim Fulk  
Engineer II

TLF:klr

# Semiannual Report on the Progress of Remedy Selection

**40 CFR 257.97(a)**

Landfill Run-off Collection Pond

Clifty Creek Station  
Madison, Indiana

May 2020

Prepared by: Indiana-Kentucky Electric Corporation

3932 U.S. Route 23

Piketon, OH 45661



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# 1 INTRODUCTION

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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 Landfill Runoff Collection Pond (LRCP). This report summarizes activities during the period of December 7, 2019, through June 7, 2020. 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 GWPS.

In May 2019, IKEC initiated an Assessment of Corrective (ACM) measures at the Clifty Creek LRCP as a result of a confirmed SSL of Appendix IV constituent Molybdenum in monitoring wells CC-15-08 and CC-15-09 during September 2018 Assessment Monitoring Activities, as required by 40 CFR § 257.97(a). An additional SSL for constituent Boron was also confirmed, but an Alternative Source Demonstration was pursued and determined to be successful. In accordance with 40 CFR § 257.96(a), IKEC prepared an ACM report for the Clifty Creek LRCP. It was placed in the facility's operating record and uploaded to IKEC's Publicly Accessible Internet Site on September 19, 2019. The ACM Report provided 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 Molybdenum above the GWPS, with two technically feasible options identified. Both feasible options require the removal of free water from the pond, followed by the execution of an engineered cap and closure of the LRCP facility, and are as follows:

- Monitored Natural Attenuation (MNA); and
- Conventional Vertical Well System (Groundwater Extraction and Treatment) (Ex-Situ)

Following the completion of the ACM Report, IKEC hosted a public meeting to present the options for remediation on November 7, 2019, in Madison, Indiana. IKEC then observed a 30-day public comment period, per 40 CFR § 257.97(a), prior to beginning the process of selecting a remedy. No comments were received during this time period.

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 more field investigation, data analysis and consideration prior to the selection of a remedy. IKEC will continue to review new data as it becomes available and implement changes to the groundwater monitoring and corrective action program as necessary to maintain compliance with the rule.

## 1.2 REPORT CONTENTS

The 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 December 7, 2019, through June 7, 2020.

## 2 SITE BACKGROUND

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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. The Type I Landfill and LRCP occupy an approximately 200-acre area situated within an eroded bedrock channel. To allow for more disposal capacity, an on-site fly ash pond was developed into a Type III Landfill in 1988. All required permits for the Type III Landfill were obtained from the Indiana Department of Environmental Management (IDEM) and the Type III Landfill went operational in 1991. In March 1994, IDEM approved a pH variance for the disposal of low-sulfur coal ash in the fly ash Type III Landfill. Emplacement of low-sulfur coal ash in the Type III Landfill began in January 1995. In April 2007, IKEC submitted a permit application to IDEM to upgrade the former Type III landfill to a Type I landfill. In 2013, IDEM issued a renewed permit and approved IKEC's request to upgrade the landfill to a Type I landfill.

The Type I Landfill consists of approximately 109 acres, and has been approved by IDEM as a Type I Residual Waste Landfill. The remaining 91 acres consist of the LRCP located at the southwest end of the Type I Landfill. The Type I Landfill and the LRCP occupy an approximately 200-acre area situated within an eroded bedrock channel.

## 2.1 UNIT SPECIFIC GEOLOGY AND HYDROGEOLOGY

Bedrock beneath the LRCP consists of impermeable limestone and shale of the Ordovician Dillsboro formation, which is overlain by approximately 20 feet of clayey gravel with sand (Applied Geology and Environmental Science, Inc. [AGES] 2018a). The clayey gravel with sand is overlain by a lean clay with sand, which is overlain by a fine to medium sand with gravel, silt and clay. The uppermost unit in the area is a surficial layer of silty clay. A limestone ridge known as the Devil's Backbone runs northeast to southwest along the length of the Type I Landfill & LRCP. The Devil's Backbone acts as an impermeable barrier that forces groundwater passing beneath the Type I Landfill to flow either toward the northeast or toward the southwest.

Based on historic aquifer testing conducted at the site, the upper lean clay deposits exhibit low permeability, do not yield adequate quantities of water to wells, and are considered to be an aquitard. The underlying fine-medium sand with silt is considered to be an unconfined or possibly semi-confined aquifer and is therefore designated as the uppermost aquifer at the LRCP (AGES, 2018).

## 2.2 POTENTIAL RECEPTOR REVIEW

IKEC completed an assessment of the proximity of public and private drinking water supplies to the LRCP 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 were not hydraulically connected to the groundwater at the LRCP facility or are located upgradient from the facility.

# 3 GROUNDWATER ASSESSMENT MONITORING PROGRAM

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Groundwater assessment monitoring for the Clifty Creek LRCP 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 LRCP consists of the following eight (8) wells:

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

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

- CC-19-08D (Downgradient);
- CC-19-14 (Downgradient);
- CC-19-15 (Downgradient); and
- CC-19-15D (Downgradient).

### 3.2 TYPE I LANDFILL ALTERNATIVE SOURCE DEMONSTRATION

The Type I Landfill and LRCP share a common monitoring network. Due to this fact, upon verification of an exceedance above the GWPS, an Alternative Source Demonstration was pursued. Based on a review of current and historic data, the Type I Landfill was not believed to be the source of Boron in groundwater in the area. An ASD was completed in general accordance with guidelines presented in the *Solid Waste Disposal Facility Criteria Technical Manual* (U.S. EPA 1993). It was concluded that the Type I Landfill was not the source of Boron detected in the area. This conclusion was supported by the following evidence:

- “Foundation soils” that extend from beneath the LRCP and the hydraulically placed fly ash southwest to the Ohio River provide a direct hydraulic connection between the historic hydraulically placed fly ash and the CCR groundwater monitoring wells CF-15-08 and CF-15-09.
- Historic data from the IDEM groundwater monitoring program indicate that Boron concentrations similar to those observed in CCR wells CF-15-08 and CF-15-09 were detected in IDEM wells CF-9406 and CF-9407 for 17 years prior to operation of the Type I Landfill, indicating that the Boron is associated with the historic hydraulically placed fly ash.
- Using the previously calculated groundwater flow velocity of 45 feet per year (ft/yr), it is estimated that it would take 120 years for groundwater flowing beneath the Type I Landfill to reach the CCR monitoring wells.

The ASD Report for the March 2018 Detection Monitoring Event (AGES 2019b) was completed in June 2019, and was certified on July 3, 2019. Based on the successful ASD, an ACM was not required at the Type I Landfill. By definition of the CCR Rule, the LRCP is unlined and the historic hydraulically placed fly ash extends beneath the LRCP to the embankment; therefore, an ACM was conducted at the LRCP.

### 3.3 GROUNDWATER CHARACTERIZATION

Groundwater assessment monitoring was first conducted at the Clifty Creek LRCP during September 2018 sampling. Molybdenum, an Appendix IV constituent, was detected and confirmed to exceed the GWPS of 100 µg/L at wells CC-15-08 and CC-

15-09. In response, IKEC was required to characterize the extent of the release, pursuant to 40 CFR § 257.95(g)(1), and installed additional monitoring wells at the property boundary (wells CC-19-08D, CC-19-14, CC-19-15, and CC-19-15D). It was determined that Molybdenum was not leaving the property at levels higher than the GWPS, and therefore the potential remediation zone was confined to the LRCP complex (AGES, 2019).

## 4 ASSESSMENT OF CORRECTIVE MEASURES

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In accordance with 40 CFR § 257.96(a), IKEC prepared an ACM report for the Clifty Creek LRCP and placed it in the facility's operating record as well as uploaded it to the IKEC's Publicly Accessible Internet Site on September 19, 2019. 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;*
- (3) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;*
- (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 Molybdenum in groundwater at the LRCP, and screened against evaluation criteria requirements in 40 CFR § 257.96(c). The two (2)

technologies that appear to be most technically feasible, and therefore most likely for selection as a remedy are:

- Monitored Natural Attenuation; and
- Conventional Vertical Well System (Groundwater Extraction) (Ex-Situ).

Both feasible options require removal of free water from the pond, followed by the execution of an engineered cap and closure of the LRCP facility. IKEC is committed to continued compliance with the requirements and timeframes of the CCR Rule, and will close the Clifty LRCP in accordance with 40 CFR § 257.102 prior to implementation of further groundwater remediation measures. Construction efforts for LRCP closure cannot proceed until such time IKEC can design and construct controls to redirect a significant volume of offsite stormwater around the LRCP, develops a closure plan and receives approval from Indiana Department of Environmental Management to proceed. IKEC is presently working with the site's Qualified Professional Engineer to develop the designs in advance of preparing the applicable permitting package.

The initial closure methods described above will reduce 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 closures and 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 LRCP will be closed in accordance with CFR § 257.102 prior to implementation of further groundwater remediation efforts. In addition to source control measures, two primary strategies were identified to address groundwater exhibiting concentrations of Molybdenum above the GWPS, including:

- Monitored Natural Attenuation; and
- Conventional Vertical Well System (Groundwater Extraction) (Ex-Situ).

The ACM report titled "Clifty Creek LRCP- Assessment of Corrective Measures Report", (AGES, 2019), 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). Both options listed above are considered technically feasible, and appropriate for groundwater remediation efforts at the LRCP.

## 5 SELECTION OF REMEDY: CURRENT PROGRESS

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As noted in the ACM Report, IKEC determined that source control would be best achieved by leaving the CCR material in place and installing a CCR compliant cap system.

During the period covered by this semi-annual report, IKEC evaluated the construction duration and constraints associated with closure in place. A preliminary cost estimate and project schedule has been developed for this portion of corrective measure activities.

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 11 wells (8 Network and 3 Sentinel) were sampled near the LRCP and the results summarized in the report, "2019 – Clifty Creek CCR Annual Groundwater Monitoring and Corrective Action Report, (AGES, 2019)"

### 5.1 PLANNED WORK

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

IKEC will develop a closure plan for the LRCP, and submit to Indiana Department of Environmental Management for approval prior to proceeding with closure efforts.

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.

IKEC will submit the next progress report by December 6, 2020.

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).